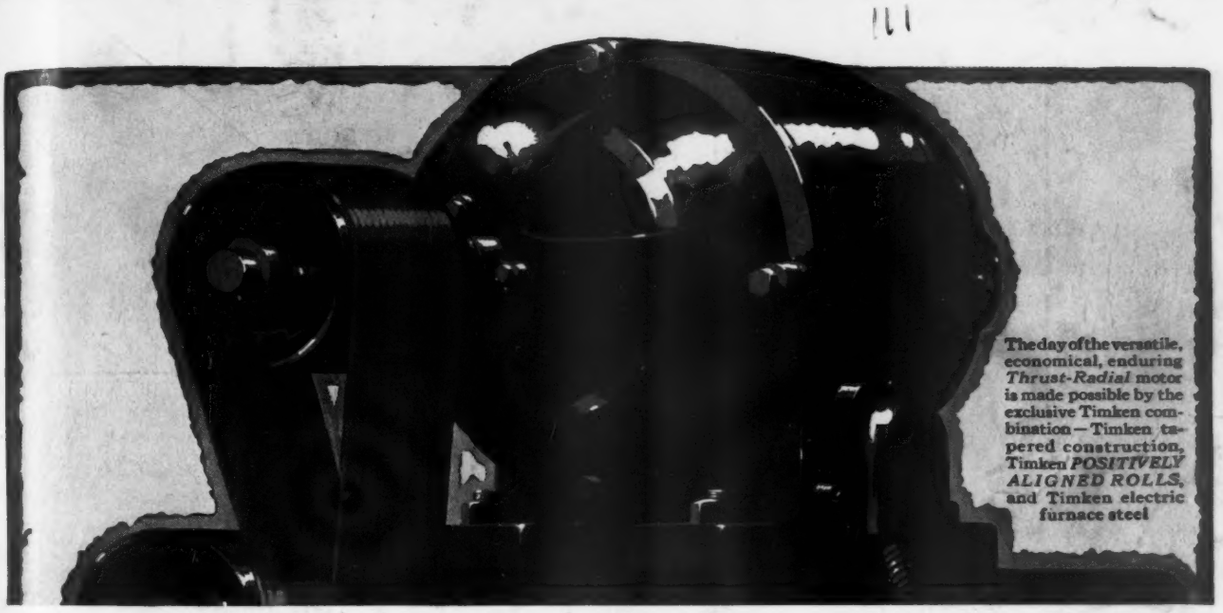
Rock Products

With which is Incorporated **CEMENT and ENGINEERING NEWS** Founded 1896

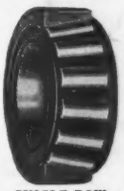
Chicago, February 4, 1928 (Issued Every Other Week) Volume XXXI, No. 3



The day of the versatile, economical, enduring *Thrust-Radial* motor is made possible by the exclusive Timken combination—Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS*, and Timken electric furnace steel

Standardize on Timken-Equipped Electric Motors

.... *Your Purchasing Department* then does not need to specify where the motors will be mounted. All types of drives, and floor, wall or ceiling positions are all the same to these *thrust-radial* motors. Simply specify horsepower, characteristics, *and Timken Bearings!*



SINGLE ROW TIMKEN BEARING

DOUBLE ROW SELF-CONTAINED TIMKEN BEARING

.... *Your Plant Engineer* then has his problems immensely simplified. There are fewer types of motors. A negligible amount of maintenance and lubrication completely guards against motor wear, burn-outs and shutdowns. Overheating risk and oil-dripping are eliminated.

.... *Your Production Department* then contends with no delays, defects and excessive costs that are chargeable to motors. Your sales department benefits accordingly!

Electric motors, like machine tools, railroad cars, steel mills and all other industrial equipment, are made far more economical and far more productive by means of Timken Bearings.

The records of thousands of Timken-equipped motors, over a period of many years, have set up the highest basis of motor efficiency ever known. That is the kind of motors you order by specifying Timken Tapered Roller Bearings in any types or makes.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN Tapered Roller BEARINGS

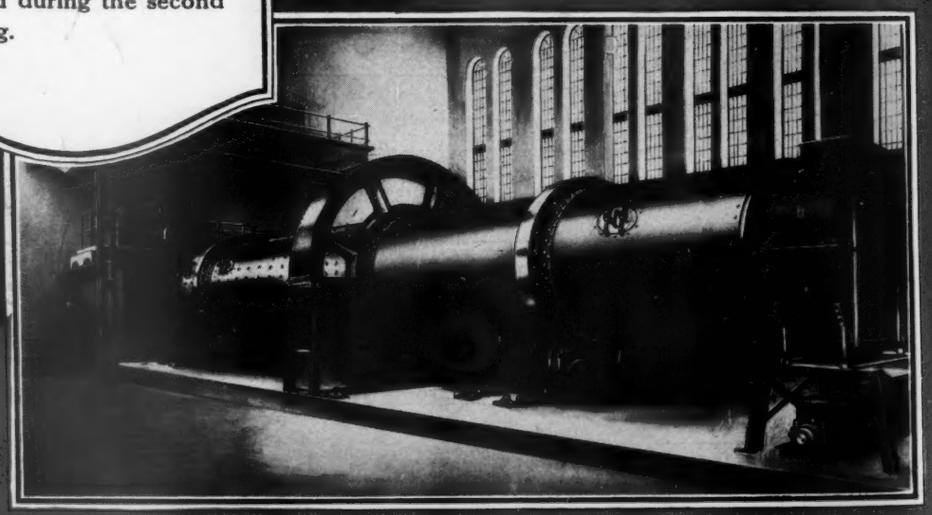
MEMBER A. B. C. *The Only Paid Circulation covering the Rock Products Industry* MEMBER A. B. P.

Printing of This Issue Is 5400 Copies. Next Issue Will Be February 18

POLYSIUS

SOLO MILLS

This mill has a special method of returning the "grits" or oversize, from the sieves to the first grinding chamber. The grits are transported back to the first grinding chamber in such a way that they will be thoroughly ground during the second passing.



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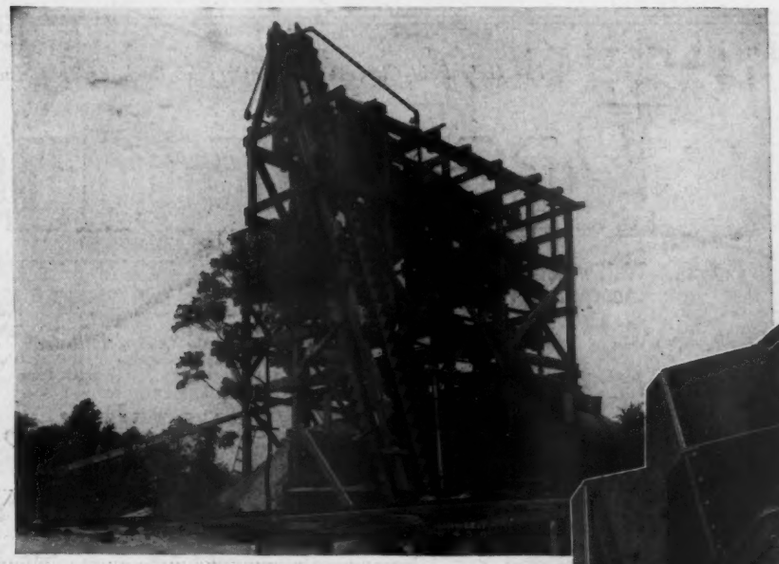

A typical illustration of Link-Belt Continuous Bucket Elevator raising sand and gravel to the screens.

Section of a Link-Belt Super-Capacity Continuous Bucket Elevator. Note how the face of each bucket forms a discharge chute for the bucket following.

Elevate Your Crushed Stone Sand and Gravel The Link-Belt Way

THREE general types of elevators are adaptable to the work of raising materials, the choice of which depends on the particular conditions existing in each case. These are: (1) the continuous bucket elevator; (2) the centrifugal discharge elevator, and (3) the digging elevator.

Invite us to go over your plant with you and make recommendation.

Address our nearest office for a copy of Book No. 540.

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The Only Paid Circulation Covering the Rock Products Industry

Rock Products

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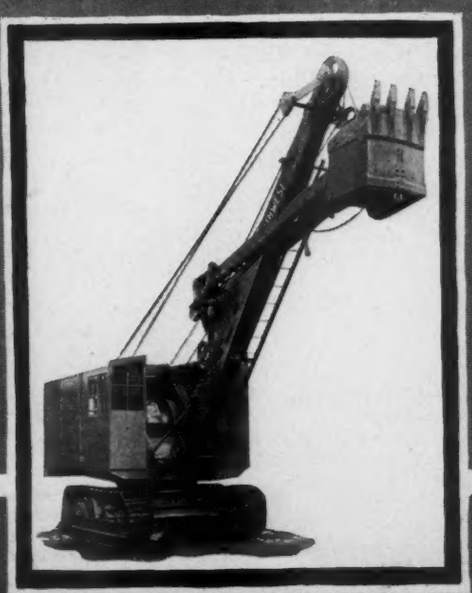

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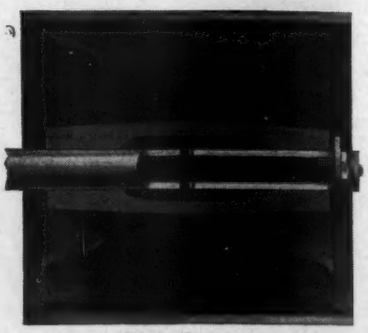
BELT conveyors carrying coal, sand, gravel, etc., need thorough pulley lubrication.

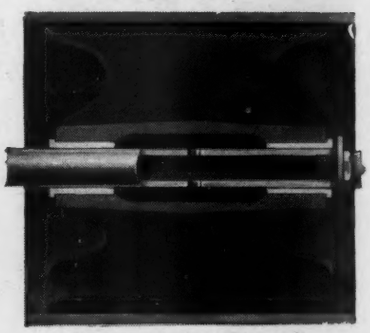
All Jeffrey Pulleys are pressure lubricated, and built with large recessed grease pockets which prevent the grease from being rubbed against the feed holes and clogging them up.

The three types of Jeffrey Pulleys are the plain, the bronze bushed and the roller bearing. Plain bearings that become worn may be bored out and replaced with the bronze bushings. For the jobs that are hard on pulleys, conveying coke breeze, for example, we recommend the Jeffrey Roller Bearing Pulleys.

Cross Sections of Jeffrey Pulleys Showing Grease Pockets and Bearing Construction



Plain Bearing



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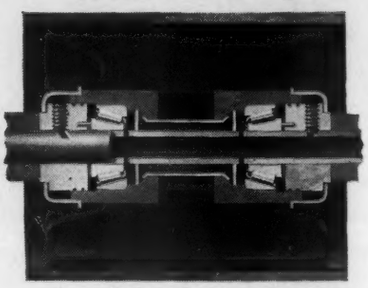
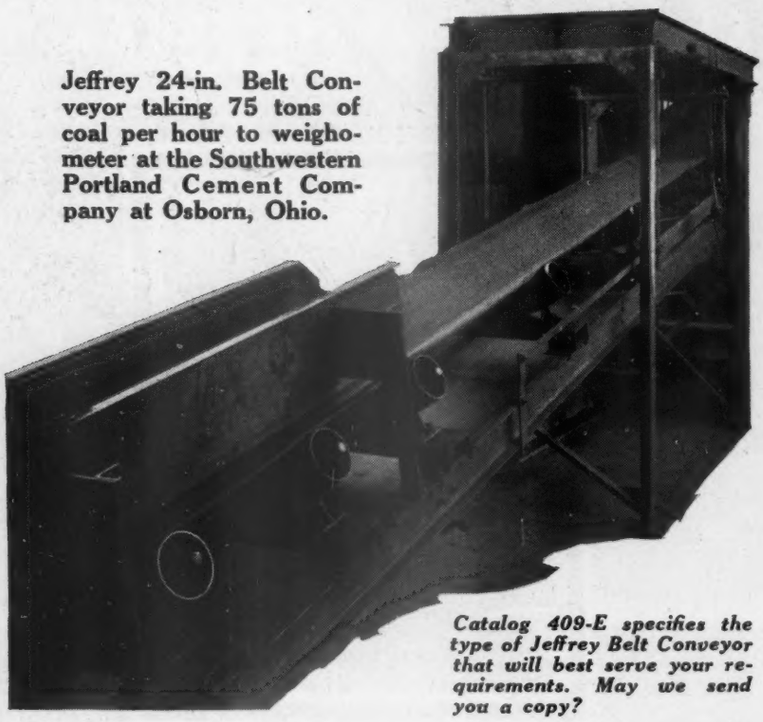


Roller Bearing



Jeffrey 24-in. Belt Conveyor taking 75 tons of coal per hour to weighometer at the Southwestern Portland Cement Company at Osborn, Ohio.

Catalog 409-E specifies the type of Jeffrey Belt Conveyor that will best serve your requirements. May we send you a copy?

The Jeffrey Manufacturing Company

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1 — **Inside dipper handle**
(For efficiency and economy)

2 — **Railroad Type Boom**
(Possible only with inside type handle)

3 — **Single reduction herringbone gear drive**
(Increases hoisting efficiency 12 to 15%)

4 — **Three part hitch**
(Eliminates shocks—reduces pulling strain on cable 66 2-3%)

5 — **Enclosed type crawlers**
(Belt travels on small rollers, closely spaced —no locking or breaking of pads)

—and many other profit making features. Send the coupon for Bulletin No. 323.

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and all the range of sizes and horsepowers in between, James Speed Reducers are best. Made in all sizes from ¼ to 1,000 hp. —ratios 2 to 1 to 2,500 to 1 or over, and in types to suit every condition of drive.

The ready acceptance of James Reducers is evidenced by over 35,000 in use today —in every industry—on every kind of drive—and operating under every service condition.

Where conditions cannot be met properly with one of the James Standard Reducers, we are singularly equipped to design and manufacture any type or size of reducer required, and our Engineering Department will gladly help you to design the proper unit for your work. This service is gratis.

Since 1888 we have been producing Speed Reducing Units to meet the needs of industry. Today we are the only manufacturers of every type of Speed Reducing Unit.... Planetary Spur Gear type to drive up, down, at an angle, or in a straight line; Commercial and Heavy Duty Worm Gear Type to drive up, down, or at right angles; Generated Continuous-Tooth Herringbone Type to drive in a straight line, or at right angles.

The proved satisfaction and longevity of James Units are due to proper design and the use of highest grade materials throughout. Our forty years' experience in the manufacture of Speed Reducing Transmissions for every reduction drive is your guarantee of longer and more satisfactory service.

James Gears are of the same enduring quality which characterizes the success of James Speed Reducers. They out-live and out-serve, and are your guarantee of smooth, uninterrupted service and greatest economy.

Send today for the latest James Catalog, free upon request—chock full of valuable and interesting information.

D.O. James Manufacturing Co.

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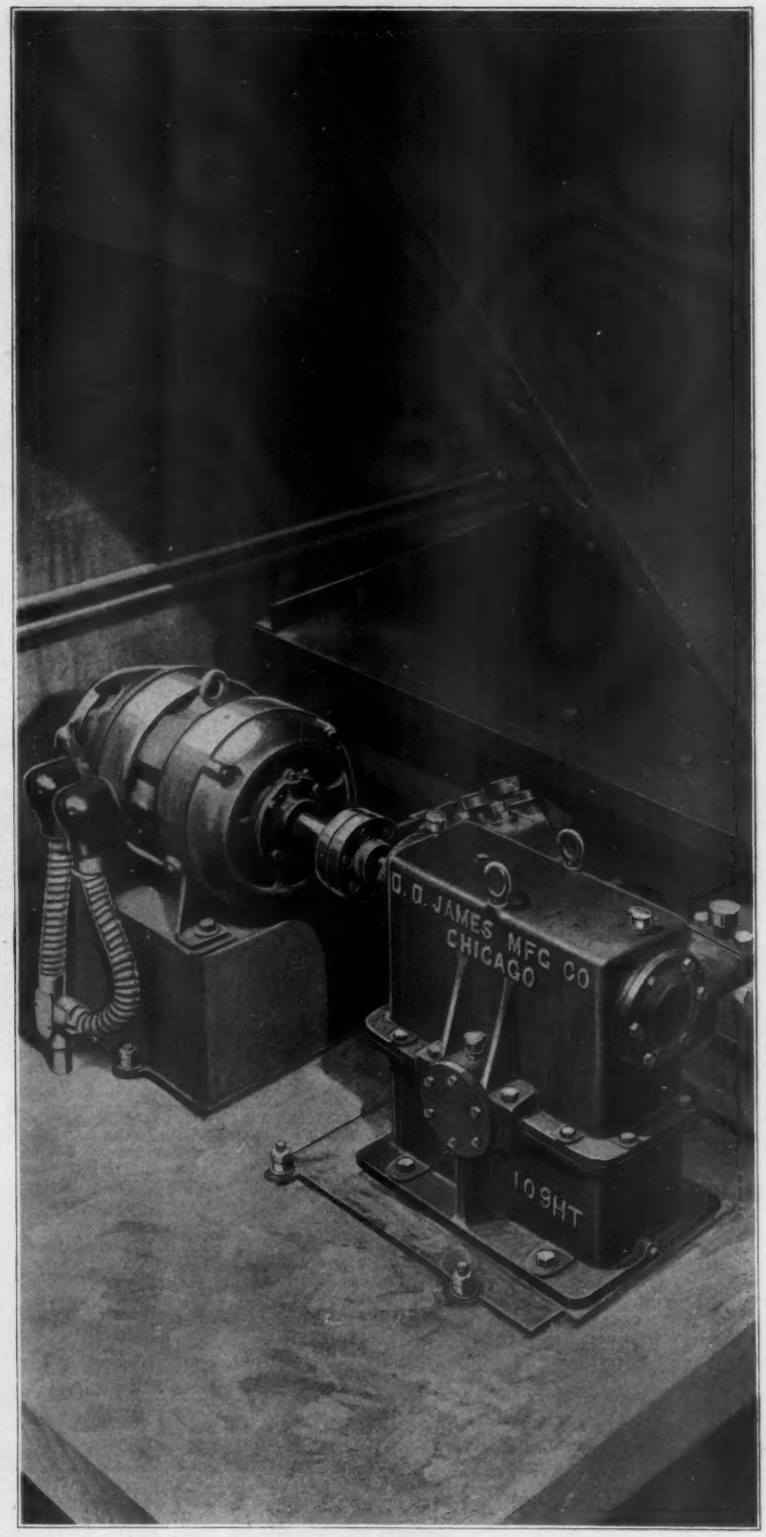

James Heavy Duty Worm Gear Speed Reducer driving on apron conveyor in a copper mine. We are manufacturers of Planetary Spur, Worm and Herringbone Speed Reducing Transmissions, to drive up, down, horizontally, or at an angle; Cut Spur, Bevel, Mitre, Worm, Internal, Helical and Herringbone Gears of all sizes and materials; Racks and Flexible Couplings.

D.O.JAMES

MAKING THE SMALL PIT PAY OUT

Team a Barber-Greene "42" or "25" Loader with even a small sand or gravel pit, and you'll find that profits swell.

Two flat, revolving disks load the buckets directly from the pit bank, from storage or loose piles to the truck. Due to these broad disks, each up-coming bucket carries a brimming load each trip. Loading time is cut with the "42" to 1¾ yards per minute.

The floating boom makes B-G's stand up under such heavy going without time out. It absorbs the strains of rough ground and sudden shocks.

"Loading Layouts" cites numerous pit jobs throughout the country, where B-G's are swelling pit profits. May we send it to you?

HANDLING BIGGER YARDAGES WITH FEWER DOLLARS

Barber-Greene Company
495 W. Park Avenue, Aurora, Ill.

Disc Feed Barber-Greene LOADERS

Model "25"—1 yard per minute

Model "42"—1¾ yards per minute

Model "28"—wheel mounted

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You Buy *More* Than Bearings

When You Specify New Departures

YOU also get an engineering service based on a knowledge and experience of bearing design and application absolutely unexcelled.

One phase of this service is New Departure application data — loose leaf bulletins which form a living, growing reference encyclopedia, always up to date through supplements and revisions issued monthly. Furnished without obligation to those in a position to use it to best advantage.

The New Departure Mfg. Company
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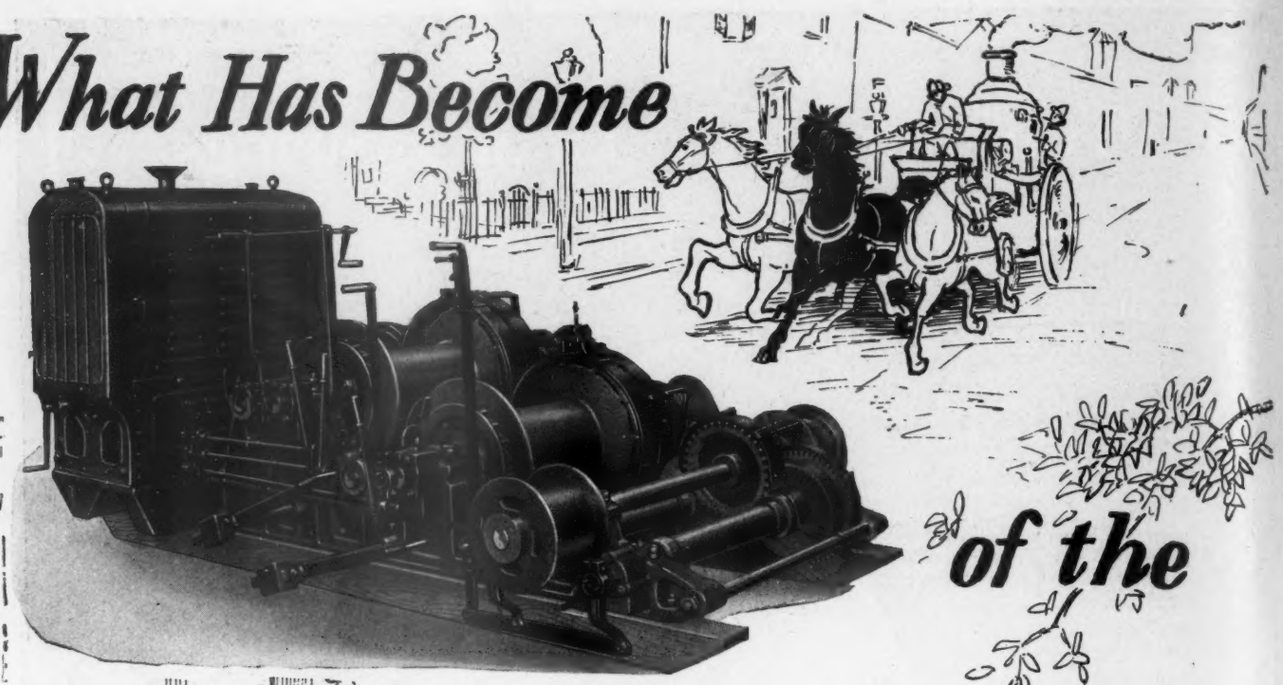
New Departure Quality Ball Bearings

What Has Become of the Galloping Fire Horses?



NO MORE does the fire horse do his stuff at the sound of the siren. No more mad gallops down the avenue with a careening fire engine or hook and ladder. The equine fire fighters have gone into everlasting retirement in favor of the efficient, motorized apparatus that is essential to successfully combat the destructive fire hazard.

In this age of speed and efficiency methods, the slow, ponderous single speed hoist is as far behind the times as a horse drawn fire engine. Such a development as the Mundy Three-Speed Hoist has relegated it to the scrap heap.

The three speeds of the Mundy Hoist give it a flexibility comparable to that of the modern fire fighting apparatus. When there's a "hurry up" job to be done, the Mundy has the speed range to finish the job while the single speed hoist would just be getting started.

If you have been using a single speed hoist, you can readily realize what it would mean to add a couple more speeds. It means a different speed for heavy, intermediate and light loads —with instant changes from one to another. *It means getting more work done quicker.*

Let us show you how the Mundy Hoist will pay you dividends on your hoisting operations.

TRADE MARK
MUNDY
ESTABLISHED 1869

To Equipment Distributors

The New Patent Three-Speed Hoist is fully protected by patents in the United States and Canada.

Some open exclusive sales territory is now available.

The Mundy Sales Corporation

Distributors for the J. S. Mundy Hoisting Engine Co.

30 Church St., New York

Agents in Principal Cities

MUNDY HOISTS

The Hoist With The Asbestall Frictions

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SO SATISFIED with First 24 Ton PLYMOUTH They Ordered a DUPLICATE

GREAT LAKES PORTLAND CEMENT CORPORATION
BUFFALO, N. Y.

August 9, 1927

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

Some time ago we purchased from you one of your Plymouth 24-ton Locomotives and put it on general switching work throughout our plant and we depended on this locomotive to switch all the cars which we received during construction. This locomotive worked over a very poor track around very stiff curves, but for all that was constantly handling four and five loaded cars, in fact, we do not think we ever asked it to do anything it did not do.

This locomotive was so satisfactory to us that a few months ago when we opened our shale quarry we purchased a duplicate for that work. Here we handle loaded railroad cars up a 2 per cent grade from our pit to the railroad company's siding in an entirely satisfactory manner. We are certainly sold on the use of these gasoline locomotives, as they are always ready to run and do not require any attention when out of service. We wish to thank you for the very satisfactory way in which you handled all business in connection with these two purchases.

Yours very truly,
GREAT LAKES PORTLAND CEMENT CORP.

Vice-President.

Due to the fact that fuel consumption varies according to the conditions of operation at different locations, it is impractical to state unit haulage costs that would apply in general. Condition of track—grades—curves—load per trip—continuity of operation—length of haul, etc., are seldom the same. For this reason we state specific examples and figures from the owner.

In a report from Mr. Hammond, Vice President, accompanying the above letter, he gives us the everyday job of the Plymouth used at the plant. Switching two to four loaded cars, making a gross weight of 156 to 312 tons over a one-half mile track—hauling a net tonnage of 1200 tons per day of 10 hours on an average daily gasoline consumption of only 20 gallons. As to special jobs, Mr. Hammond states they have hauled 31 empty railroad cars—also 11 loaded railroad cars—each carrying their capacity of 50 tons.

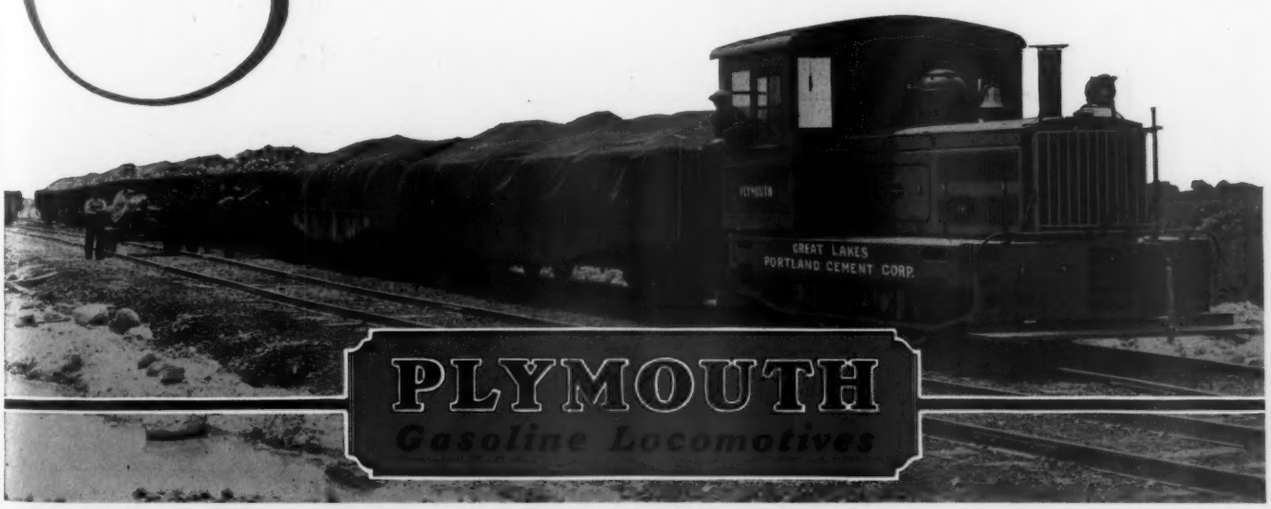
If we know your job and conditions we can closely estimate what your haulage cost will be with a Plymouth and just how long it will take to PAY FOR ITSELF.

PLYMOUTH

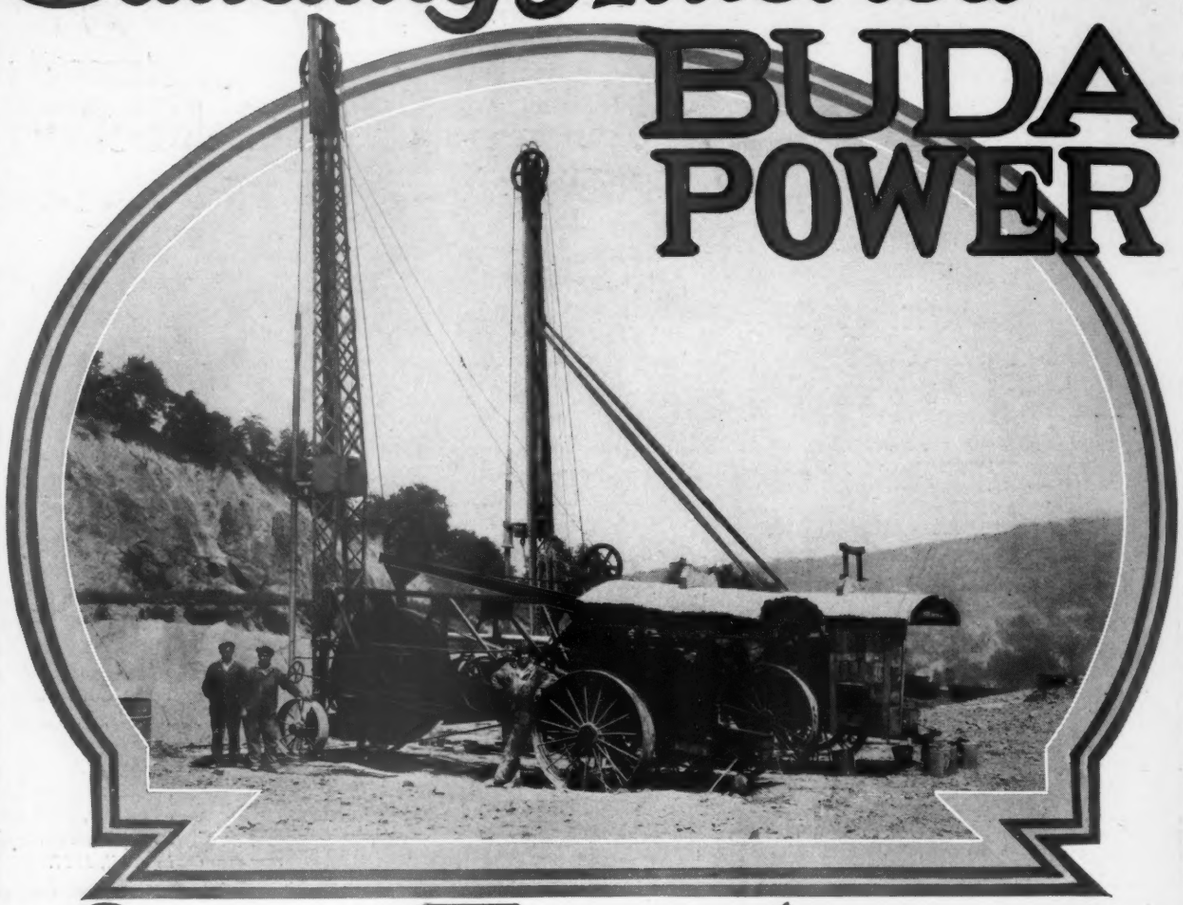
Photos taken in August, 1927, at plant and shale pit of Great Lakes Portland Cement Corporation, Buffalo, N. Y., show their two 24-ton Plymouths. The one at the plant was purchased in July, 1926, and its duplicate at the pit in April, 1927.

If it's a Track Haulage Problem There's a PLYMOUTH to Solve it

PLYMOUTH LOCOMOTIVE WORKS
The Fate-Root-Heath Company
PLYMOUTH, OHIO



Building America with BUDA POWER



For Instance **Armstrong** DRILLING MACHINERY

Two BUDA-Powered Armstrong Drilling Machines that are used **24 hours daily**—drilling trap rock—in the quarry of the John T. Dyer Company, near Birdsboro, Pa. Real performance! And the BUDA Engines are reported to be "standing up admirably."

The Armstrong Machinery Company, builders of Drilling Machinery since 1867, says: "The Buda Engine has proven especially well adapted for drill service, due to its efficient operation and low upkeep—in fact, the repair expense has been practically nothing."

The Buda Company Chicago Suburb **Harvey, Illinois**

Nine Sizes

BUDA INDUSTRIAL POWER

20 to 150 H.P.

that follows every War—
the Battle for Cost Reduction

EVERY manufacturer is fighting that battle on the field of industry today, particularly in the production of raw materials and basic products.

This is not new phenomena. Study the economic history of this country following the Civil War. What happened?

During the conflict, prices and costs went sky-high. After it ended, they worked steadily and relentlessly downward for eleven years.

The same thing occurs as the natural and inevitable result of every war. Industrial conditions of the past decade indicate this fact.

We are not making predictions as to the future, but we are offering means to overcoming some of the cost handicaps that are now making profits difficult in the process industries.

Since 1887 RAYMOND EQUIPMENT AND METHODS have been allied on the side of economy in the production of powdered materials.

New opportunities for increasing profits in the process industries are made possible by constant improvements and developments in Raymond equipment. One of the most important and recent of these is the

Raymond KILN-MILL

which greatly simplifies the manufacture of rock products by **drying and grinding** in a single, simultaneous operation.

It eliminates separate dryer equipment, saves building space, lessens labor and upkeep costs and delivers a better quality product.

The KILN-MILL is applicable to the **dry grinding** of a wide variety of materials, such as gypsum, clay, limestone, coal, white lead and phosphate rock.

Perhaps your product may be more economically processed by the **drying-in-the-mill** method of grinding. Our engineers will be glad to give you specific information on this point.

Our new book gives full particulars of the KILN-MILL, and describes the recent developments in Raymond pulverizing equipment. Ask for

A New Frontier in Methods of Pulverizing and Handling Powdered Materials.

Write for your copy today. It will be mailed promptly on request.

The Raymond Bros. Impact Pulverizer Co.

Subsidiary of the

International Combustion Engineering Corporation

1307 North Branch St.
CHICAGO

342 Madison Ave.
New York

Subway Terminal Bldg.
Los Angeles

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Regained Clinker Heat Cuts Off $200 on every $1000 Fuel Bill

You cannot buy $1000 worth of coal for $800. But you can save $200 on every $1000 fuel bill if you install the specially equipped MIAG Rotary Kiln, proved to be the lowest fuel consumer ever made.

MIAG special equipment for sealing kiln and cooler, and regaining clinker heat, can be used in any kiln equipped with clinker cooler, lowering fuel consumption 20%.

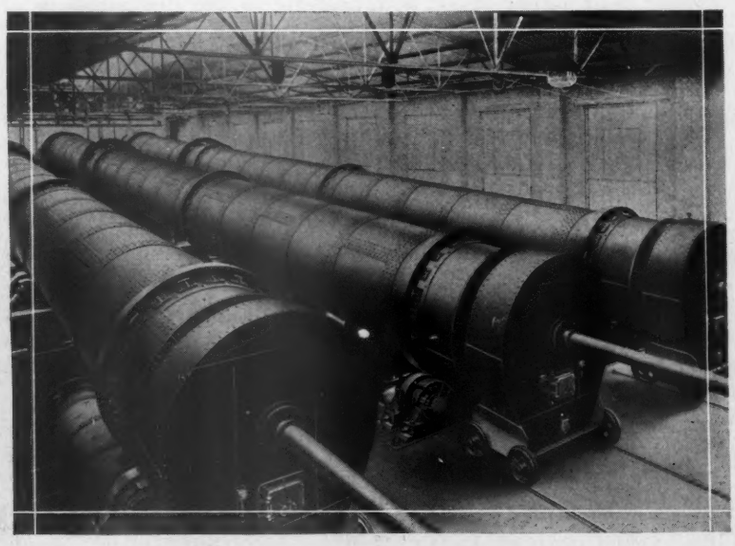
While you are considering this 20% dividend paying investment, it may interest you to know that for over seven years MIAG has been using single roller bearings with oil lubrication on Rotary Kilns. In these bearings, the oil doesn't have to be changed in six or more months.

Learn more about MIAG. Let MIAG help modernize your plant.

MIAG

machinery manufactures cement, lime, gypsum, etc., all over the world.

Right now, you may be interested in information pertaining to MIAG Titan Crushers, Compartment Mills, Roulette Mills, Rotary Kilns or Coolers with equipment for special low fuel consumption; Torpedo Shaking Conveyors, Dust Collectors, Gyratory Crushers, Roller Mills, etc.



Miag Rotary Kilns

AMERICAN MIAG CORPORATION

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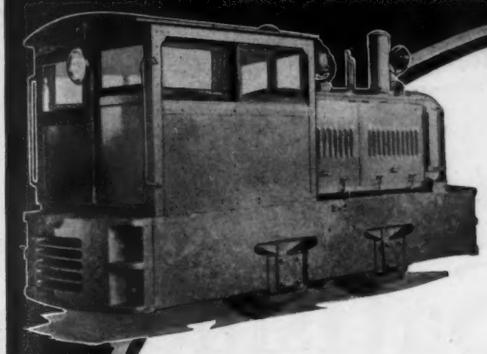


ECONOMY!

WHITCOMB locomotives have established new records for **low cost haulage.**

These records have been made on many different kinds of industrial hauling jobs, sometimes under very difficult conditions. At one plant, a Whitcomb 25-ton gasoline locomotive replaced two 50-ton steam locomotives. The two steamers were sold for enough to pay for the new "Whitcomb." At another plant, an annual saving of $2500 in demurrage costs was effected by the installation of a "Whitcomb." At still a third plant, an annual saving of $22,200 in switching costs was brought about by the purchase of a "Whitcomb."*

Whitcomb Locomotives are always "at attention"—ready to work at a moment's notice. And they stay on the job indefinitely. They are capable of twenty-four hour service day after day with only an occasional stop for gas and oil.

All locomotive standby expense is eliminated. So, too, are the old troublesome flues and grates. And they are so simple in design that anyone can operate and care for them.

Made in sizes from 3½ to 50 tons, for all track gauges. Gasoline or electric powered. Write us your requirements.

GEO. D. WHITCOMB COMPANY

Plant at Rochelle, Illinois

Offices in Principal Cities

***Names on request.**

WHITCOMB LOCOMOTIVES

GASOLINE ELECTRIC

Practical Points that Provide

100 *Per Cent* Screen Satisfaction

A few outstanding characteristics of the Galland-Henning Rollerless Rotary Screen that contribute to its universal success in stone crushing and gravel plant service.

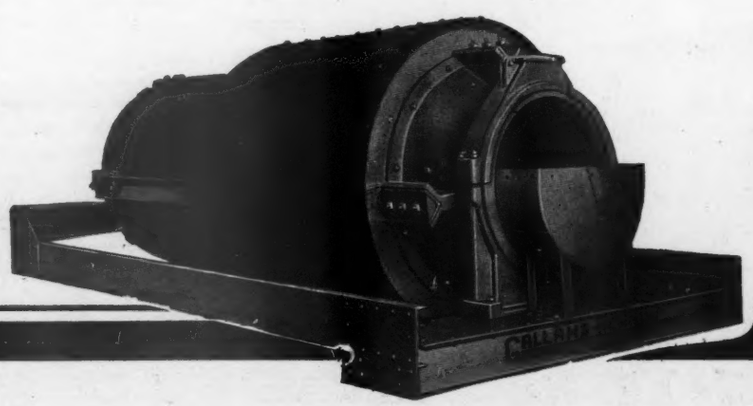
SIMPLE—A minimum number of moving parts, obtained through the elimination of Rollers and Riding Rings, marks this screen as one of the simplest yet designed. Only two bearings are required, and these are of large diameter—giving ample bearing surface.

SELF-ALIGNING—The feed and discharge ends revolve in single babbitted bearings which support the screen and provide a self-aligning feature. No adjustment necessary. The drive shaft and end bearing supports are cast integral to insure proper mesh of the bevel gears.

ACCESSIBLE—Complete dismantling is never necessary. After long service, the babbitted and bearing shells and the phosphor bronze wearing ring provided to take the end thrust of the screen can be quickly and easily replaced. The Drive Gear is bolted to the discharge end head and is readily detachable.

LONG SERVICE—LOW MAINTENANCE—Rugged construction, efficient lubrication, removable feed and discharge end liners and other practical features of the Rollerless Rotary insure long, continuous service at minimum maintenance cost.

If you contemplate the installation of another screen, you will want to know all about the advantages of the GALLAND-HENNING ROLLERLESS ROTARY.



GALLAND-HENNING
MANUFACTURING COMPANY
MILWAUKEE — U. S. A.

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Yes, Sir!

that TRU-LAY test sure pays dividends

from the experience of a cable user

500 hours service was the most we had ever had from one cable. The job certainly was a bearcat for testing purposes.

Not much wonder we tried Tru-Lay the first moment we heard of it—we were *hunting* for a Super-Wire-Rope.

I remember the first sample that came in. It seemed impossible that a piece of steel wire rope could be handled without seizing. I remember the manager played with the sample all day—taking strands and wires out of it, and laying them back in place.

Well, that demonstration convinced us there was a difference so we put on a test cable. The first one we had gave us 950 hours—practically just double anything we had ever had before—and that's what's happened ever since.

It certainly paid us to make that Tru-Lay test.

On a good hoisting shovel job or similar heavy work, the best work is none too good. Get a sample of this rope and see for yourself how added life is built in by use of the Preformed construction. Remember, too, it is easier to use. You cut and handle it like bar. Your name and address brings a sample. Get it today.

AMERICAN CABLE COMPANY, Inc.

105 Hudson Street, New York City

District Offices: Chicago Cleveland Detroit Philadelphia Pittsburgh Tulsa San Francisco

An Associate Company of the American Chain Company, *Incorporated*

Dominion Wire Rope Company, *Limited*, Montreal, Sole Canadian Licensed Manufacturers

PREFORMED WIRE ROPE

TRADE **TRU-LAY** MARK

(REG. U. S. PAT. OFF.)

Power — Speed — Endurance

UNIVERSAL PORTABLE CRANES

PLUS

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked
Factory Certified

That's the story—briefly told—and it all sums up into one word—

"SATISFACTION"

What's the sense of making a **good** shovel or crane and using rope the grade of which you know nothing about? WILLIAMSPORT **Proves** their grade. They make the only wire rope that is factory certified.

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Use Madesco Tackle Blocks—They Stand the Gaff

Madison Sand & Gravel Corp.
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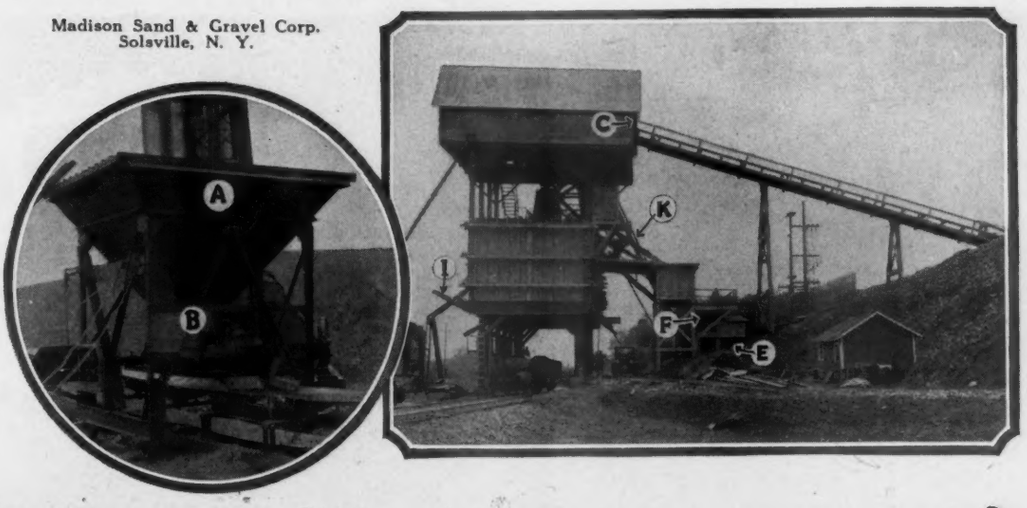
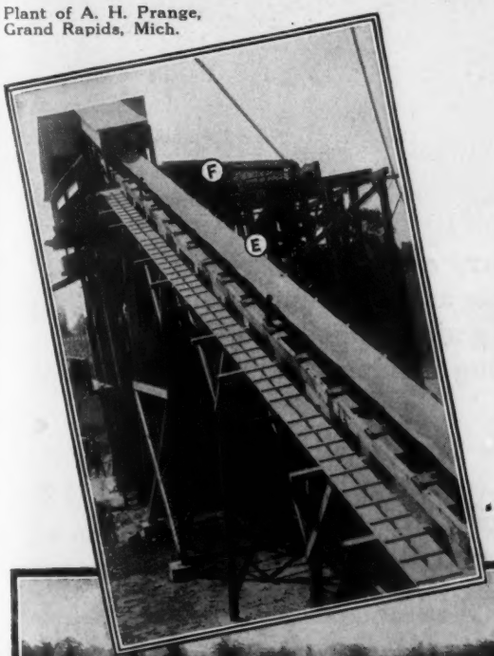


Efficient *gravel plant machinery plus experienced responsible* Service

No gravel plant was ever a success with poor machinery—yet many plants, even with good machinery, are only half a success. Telsmith gravel plants run smoothly, efficiently and profitably—they are a complete success because they are **scientifically planned** as well as **efficiently equipped.**

Telsmith Engineers have been building successful gravel plants for over twenty years. Yet they have never built two plants exactly alike. Every pit is different and the markets vary, too. Telsmith plants are highly individualized to fit conditions exactly. Not only does every piece of machinery work efficiently, but it is properly co-ordinated and balanced with every other unit throughout the whole plant.

Plant of A. H. Prange,
Grand Rapids, Mich.



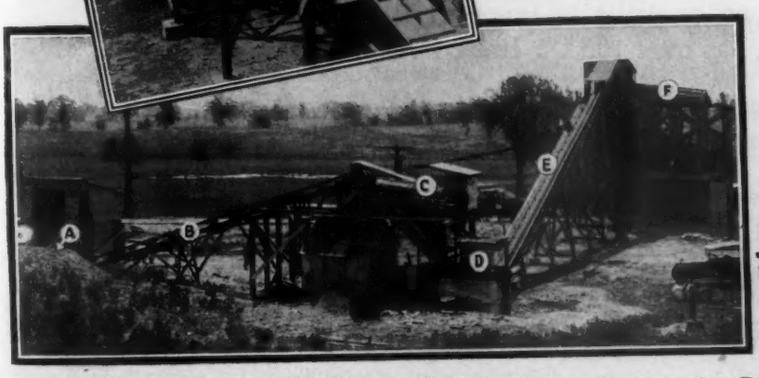
TELSMITH

After Telsmith Engineers have laid out a plant and decided on the equipment they are not dependent on anyone else to design or build any part of the machinery. They have complete facilities in Telsmith's new and thoroughly modern factory to manufacture everything—from crushers to bin gates.

Telsmith divides responsibility with no one. Telsmith Balanced Service means that you make but one contract, with a single concern of known financial standing—thoroughly capable in every way to guarantee results. Write for Bulletin G. P. 11 **today.** It's free.

SMITH ENGINEERING WORKS

86 Capitol Drive **Milwaukee, Wis.**



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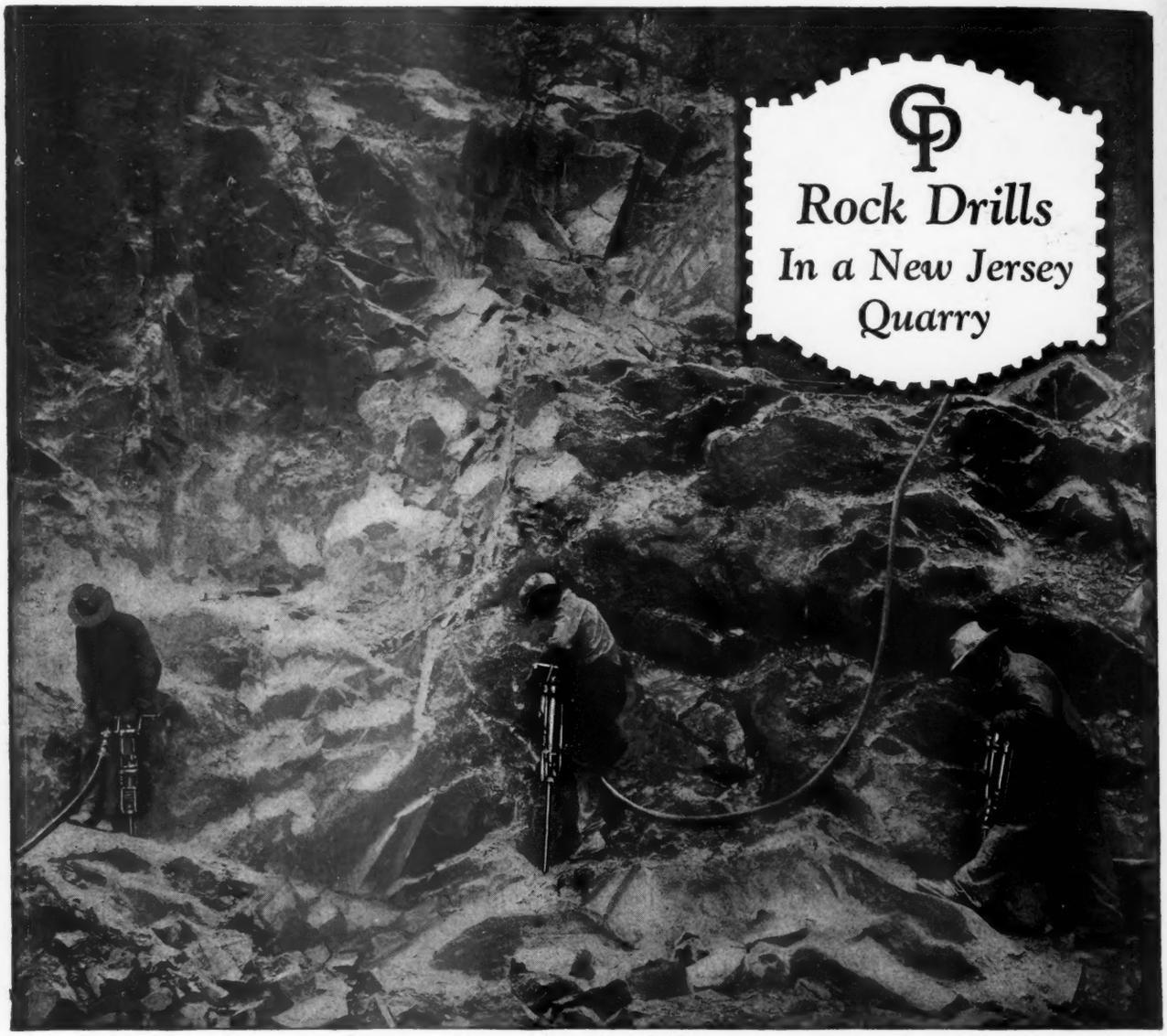

THESE CP-10 Sinkers enable the quarry owners to produce a large volume of rock in a short time at a minimum cost. Three drills, using 12 to 14 ft. steel and air supplied by a CP Portable Air Compressor, keep the crushing plant operating to capacity.

Wherever drilling is to be done, CP drills can show most convincing results. For example, one of the country's largest contracting firms recently conducted severe competitive tests which resulted in discarding other drills in favor of CP's. That firm (name on request) now has over 100 CP Rock Drills in use.

We welcome tests with any drills—may we send you our Rock Drill Bulletin?

CHICAGO · CP · PNEUMATIC

Chicago Pneumatic Tool Co.

Sales and Service Branches all over the world

6 East 44th Street New York, N. Y.

R-128

CHICAGO · CP · PNEUMATIC

When writing advertisers, please mention ROCK PRODUCTS

FALK

Speed Reducers

Falk Standard Speed Reducer,
Double Reduction Type.

Ratings

THERE is no guess work in selecting a Falk Speed Reducer for any job. Each unit is rated for continuous duty. Each unit has an efficiency of 97% to 98½%, depending on number of reductions. All ratings embody 100% overload reserve for starting and emergency.

Falk Speed Reducers are precision built throughout. They do not vary. Produced on a standardized basis. Delivered from stock on standard ratios.

Selection of the right unit for any job is made easy by using Falk Bulletin No. 160. This bulletin available upon request.

Let us quote for comparison on your present needs

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FALK

Flexible Couplings

Falk Shock-absorbing Flexible Coupling

Gives you torsional resiliency and perfect alignment

Proved in Adversity

IT IS on the tough jobs that Falk Flexible Couplings are best known. Steel mill work, grinders and hammer mills, heavy hoists, oil engine drives. On jobs where duty is hard and dependability absolutely essential.

We have a bulletin—No. 151—showing what this coupling is doing in service. A copy is yours for the asking.

Better machines have these couplings as original equipment.

The Falk Corporation , Milwaukee

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CONFIDENCE

A new kind of "confidence game"

THE NEW KIND of confidence game is played by American industry. The rules are simple. You select those companies in whom you have complete confidence and you buy their products.

That's why Haynes Stellite is proud of 1926.

It was a year of progress and of achievement. Stellited bits drilled oil wells, with enviable records of economy and speed. Stellited parts cut down maintenance costs in cement mills. Stellited tools extended the usefulness of Haynes Stellite in machine shops and automotive factories.

Booklets describing the use of Haynes Stellite and the Stelliting process will show you where you can use them in your business. They will gladly be sent on request.

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation
KOKOMO, INDIANA

District Sales Offices: Carbide and Carbon Building, 30 East 42d Street, New York; Peoples Gas Building, Chicago; Keith Building, Cleveland; General Motors Building, Detroit; 114 Sansome Street, San Francisco; 1310 Santee Street, Los Angeles.

Excerpt from first advertisement in 1927

MORE people played the new kind of confidence game with us in 1927 than ever before. We are naturally proud of this record.

Yet, after all, there is nothing mysterious about it. Our trump cards were Quality, Uniformity, Service and Fair Dealing. There are no aces up the sleeve in the kind of confidence game we are talking about. All cards are on the table and everybody wins.

We enjoyed playing the game with our customers last year. We intend playing the same game this year in the same way.

Plan to join us in 1928. Our present customers will tell you how successfully the new kind of confidence game is played.

HAYNES STELLITE COMPANY
Unit of Union Carbide and Carbon Corporation

UCC

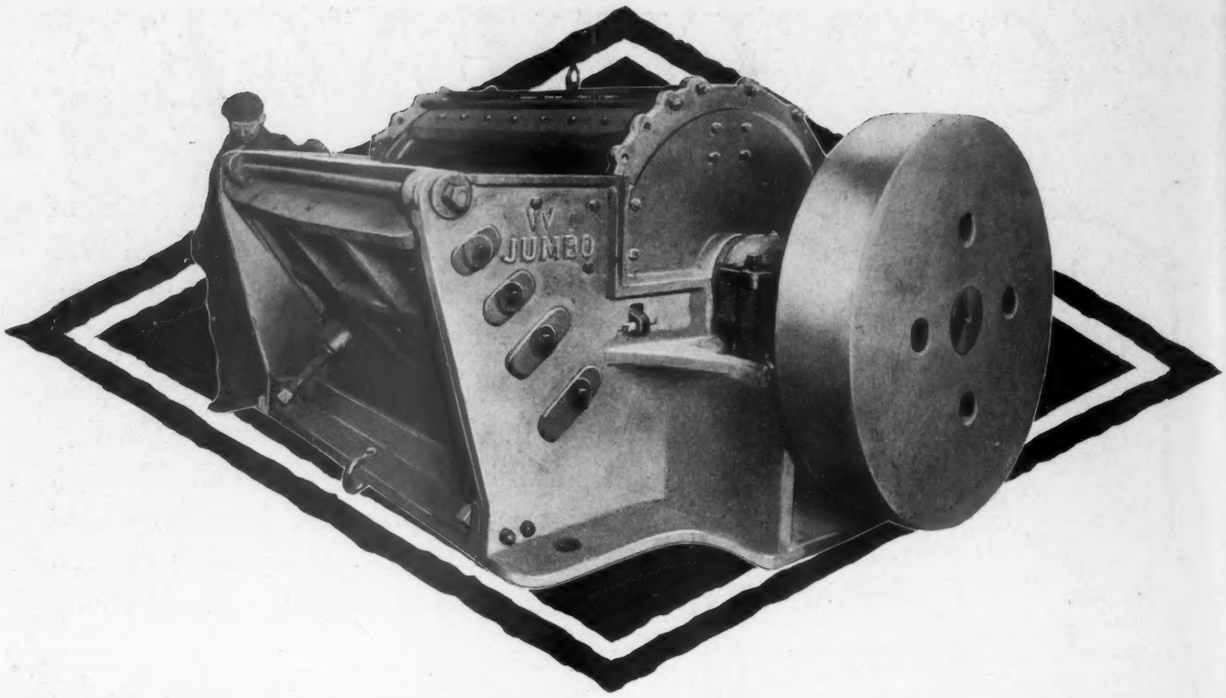
DISTRICT SALES OFFICES

Chicago—*1949 Peoples Gas Bldg.*
Cleveland—*628 Keith Building*
Detroit—*4-240 Gen'l Motors Bldg.*
Houston—*6119 Harrisburg Blvd.*
Los Angeles—*1310 Santee Street*
New York—*30 East 42d Street*
San Francisco—*114 Sansome St.*
Tulsa—*Exchange Nat. Bank Bldg.*

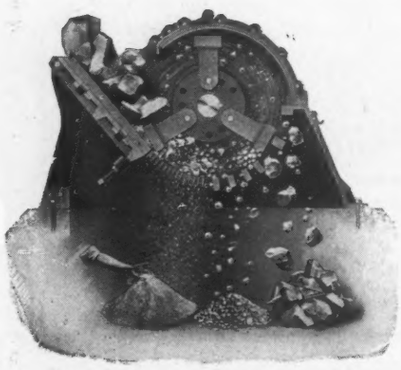
General Offices—Kokomo, Indiana

Stelliting with

HAYNES STELLITE



Now, the THIRD Williams Hammer Crusher for Dolese Bros. Co.



Sectional view of Williams Hammer Crusher showing how the rock is crushed by impact with the fast revolving hammers. By using grates with larger or smaller openings, any size finished product can be obtained.

Far sighted quarrymen in every locality are rapidly learning the advantages of Williams hammer crushers.

The Dolese Bros. Co., with plants in Iowa, Kansas, Oklahoma and New Mexico, is a typical example. Their first Williams Jumbo Crusher was installed at Eldorado, Kansas, in October, 1925. Since then a duplicate has been installed at Bromide, Okla., and a third ordered for their Crusher, Okla., plant.

By handling larger rock and reducing to the required size in one operation, one Williams does the work of a primary crusher and re-crusher. The Jumbo, for example, takes limestone as large as 24-in. and crushes to 2½-in., 1¼-in., or ¾-in. (depending upon adjustment) in one operation. Investment is cut 50% to 75% and crushing costs also greatly reduced.

Williams builds 30 sizes of hammer crushers. Write for performance records and list of nearby users on work similar to yours.

Williams Patent Crusher & Pulverizer Co.
800 St. Louis Ave., St. Louis, Mo.

Chicago
37 W. Van Buren St.

New York
15 Park Row

San Francisco
415 5th Street

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. · TRADE MARK · REG. U.S. PAT. OFF.

Williams

ORIGINAL PATENTEES AND WORLD'S LARGEST BUILDERS OF HAMMERMILLS

PATENT CRUSHERS GRINDERS SHREDDERS

When writing advertisers, please mention ROCK PRODUCTS

Sharp, deep-penetrating teeth of forged steel, cut to proper bevel and digging pitch . . . tightly bolted to hard, heavy, special alloy, shock-resisting lips . . . on strong steel jaws with tremendous digging power behind them.

Owen Bucket teeth and lips hit first. The entire weight of the bucket forces the jaws into the material before the counterweight touches, and so makes sure of a full load.

That's an Owen . . . a mechanically perfect mouth, built specifically to get a capacity bite every time.

These are just a few of the 17 sound reasons why Owens Get A Mouthful at Every Bite and More Bites per Day. Send for the whole story.

THE OWEN BUCKET CO.

6021 BREAKWATER AVE. · CLEVELAND, OHIO

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

Owen Buckets

When writing advertisers, please mention ROCK PRODUCTS

"Works every day every season . . . . . moving almost constantly . . . . . up heavy grade—"

A. Y. REED P. F. GILLETTE G. R. GILLETTE

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ELGIN, ILL.

ELGIN PHONES
OFFICE - 1737
RES. - - 2327

December 14, 1927.

Davenport Locomotive & Manufacturing Corp.,
Davenport, Iowa.

Dear Sirs:-

Recently we observed an announcement of your reorganization. Before the pleasant memories we have of the old Davenport Locomotive Works pass - although you have simply reorganized - you may be interested in our experience with one of YOUR locomotives.

Had you ever noticed how long we have been a customer of your Company? If so, you observe we have been such at least twelve years.

The writer wishes to assure you that during all of this period our relations, in every particular have been very pleasant.

The service, too, has been very, very satisfactory. During all of this period not once has fault been found with any repair work you have done for us. Nor with any replacement parts. Possibly once or twice there was made a slight error in shipment of replacement parts, but the correction has always been made pleasantly and promptly.

That little twenty-three ton DAVENPORT Standard Gauge Locomotive we purchased of you in the Spring of 1915 has been very serviceable. During all of the period from the time of arrival of the Locomotive until the close of our 1926 season, this Locomotive worked every day of our Open season, 9 or 10 hrs. each day, and during those 9 or 10 hrs. it was moving almost constantly.

It has been a busy Locomotive, pulling a 100,000 capacity high hopper steel car loaded to the limit with sand and gravel. That really means over 100,000 lbs. The pull on each trip is always up a heavy grade for much of the distance.

During the early part of our 1927 season the Locomotive was kept in reserve as an extra. During the month of October and November it was again put in active service, and all day long used for spotting, opposite our washer, gondolas from 100,000 to 140,000 capacity, and when these were loaded with sand or gravel set them over on the loading track.

Little "Mary", as she is nicknamed, is not yet ready to "Sing her Swan Song," for next year she will have to again assume her share of duties.

Anticipating a future service as satisfactory as the past, and a continuance of pleasant business relations.

Yours truly,

A. Y. REED GRAVEL CO.,

By P. F. Gillette

PFG:LL

—*that's a* DAVENPORT

This is only one of many similar expressions from customers in all parts of the world regarding the service DAVENPORT Locomotives are giving.

"DAVENPORT" is synonymous with dependability in industrial locomotive service. Hundreds of users have ordered and re-ordered DAVENPORT Steam Locomotives.

Anaconda Copper Mining Co. have ordered 15; National Lime & Stone Co., 7; U. S. Gypsum Co., 3; Monarch Cement Co., 4; International Cement Corp., 9; Dewey Portland Cement Co., 4; Union Rock Co., 4.

There is a size and type—from 7 to 70 tons—for every need.

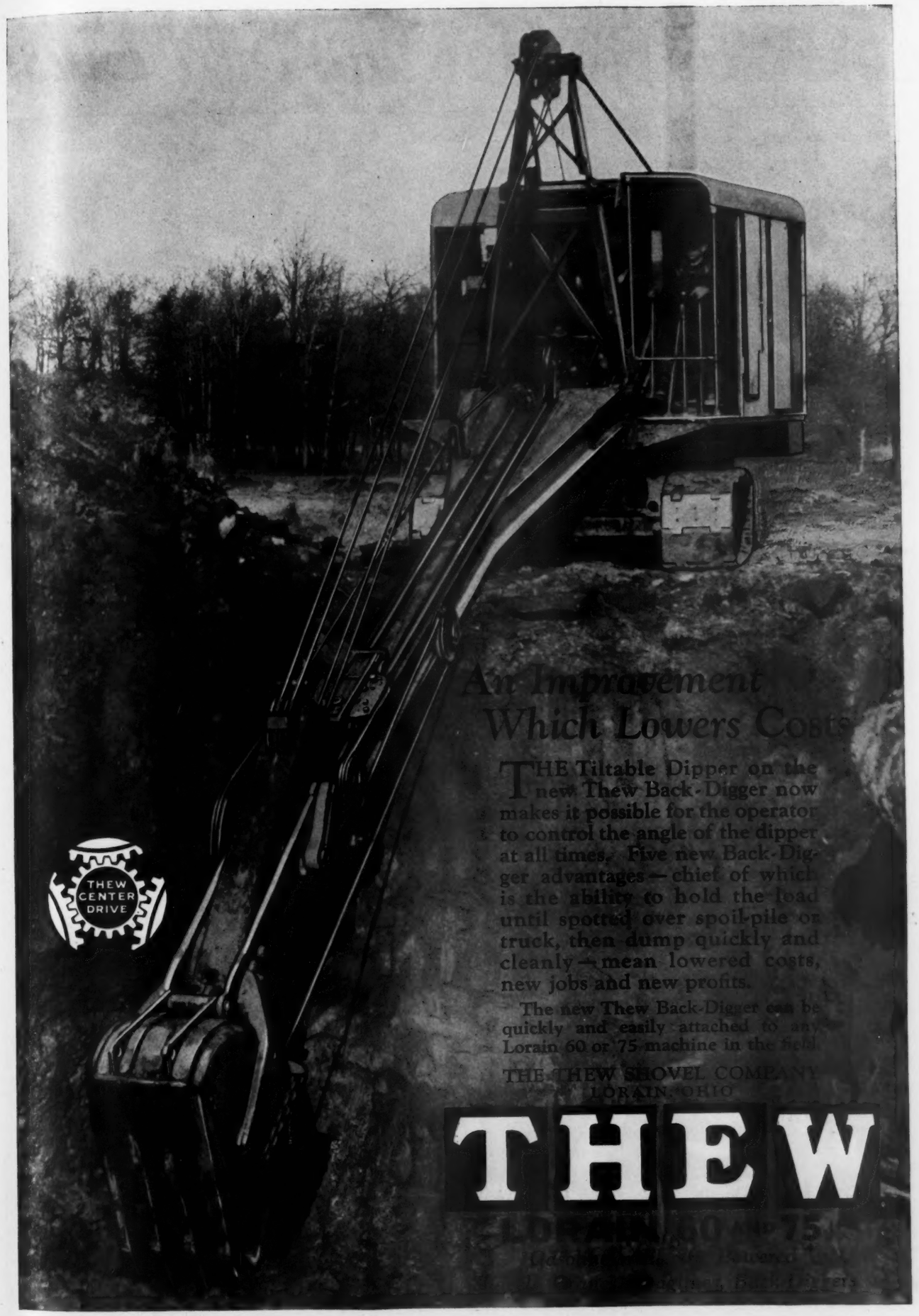
Specifications for your particular work furnished upon request

DAVENPORT

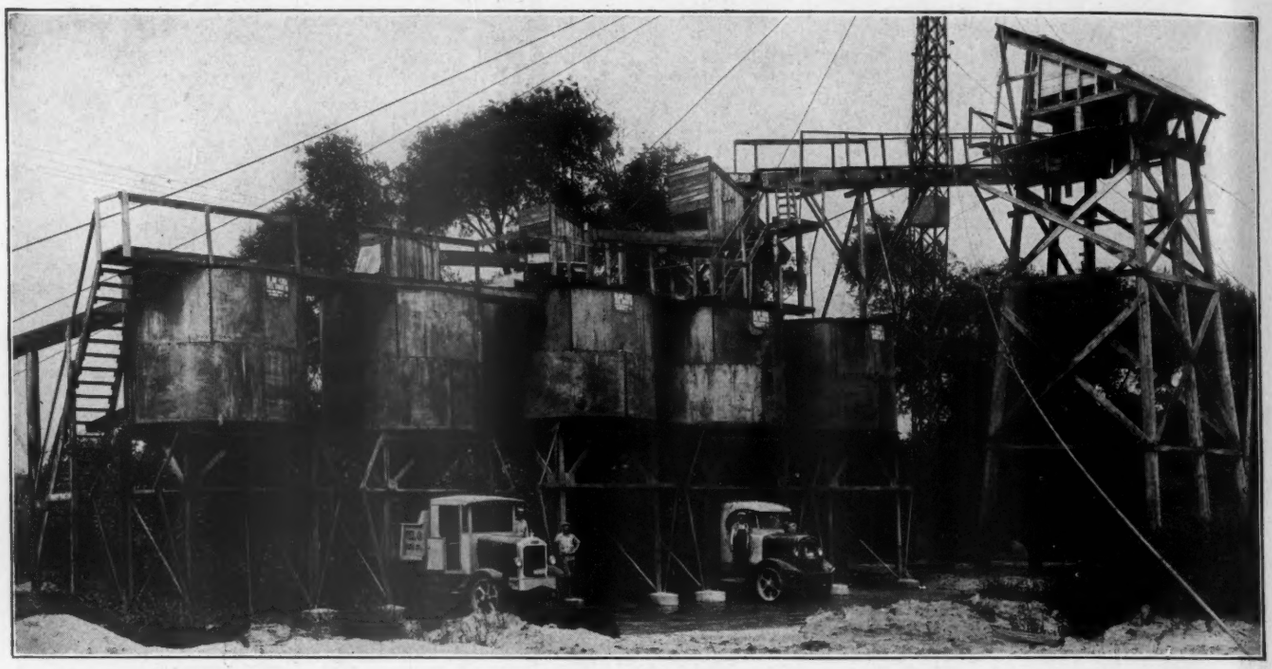
LOCOMOTIVE AND MANUFACTURING CORPORATION

Davenport, Iowa

Export Representatives: International General Electric Company, Schenectady, New York


An Improvement
Which Lowers Costs
THE Tiltable Dipper on the new Thew Back-Digger now makes it possible for the operator to control the angle of the dipper at all times. Five new Back-Digger advantages — chief of which is the ability to hold the load until spotted over spoil-pile or truck, then dump quickly and cleanly — mean lowered costs, new jobs and new profits.
The new Thew Back-Digger can be quickly and easily attached to any Lorain 60 or 75 machine in the field.
THE THEW SHOVEL COMPANY
LORAIN, OHIO
THEW
THEW CENTER DRIVE

BLAW-KNOX *Circular Steel Bins*



Battery of five Blaw-Knox Circular Steel Bins, used by Stevens Gravel Co., Indianapolis, Ind. This battery of bins is conveniently used in conjunction with the sand washing plant shown. The three bins shown at the right are used for gravel with capacity of 130 tons each, and the two bins at the left are used for storage of sand with capacity of 80 tons each.

self-cleaning

Blaw-Knox Circular Steel Bins are absolutely self-cleaning—the hopper-bottom construction and smooth sloping sides keep all storage alive.

No more do storage requirements present the expensive and bothersome problem of designing and building a bin.

Blaw-Knox relieves the problem with a complete line of standard STEEL Storage Bins. Easy in operation, never a maintenance cost—and infinitely better than any wooden bin that can be built, their first cost is surprisingly low.

All Blaw-Knox Bins are equipped with the never-failing "no-jam" strike-off gate.

Because of the ease with which Blaw-Knox Bins can be erected (and moved if necessary), they are extremely popular among dealers and producers of sand, gravel, stone, slag, coal, etc.

Write for our catalog on Circular Steel Bins and study the interesting installations we have made.

Export Division
Milliken Bros.—Blaw-Knox Corp.
342 Madison Ave., N. Y. City

BLAW-KNOX COMPANY
635 Farmers Bank Bldg., Pittsburgh, Pa.
Representatives in Principal Cities

RCB413

BLAW-KNOX

TRADE MARK REG. U.S. PAT. OFFICE BLAW-KNOX

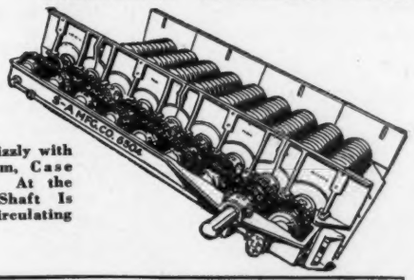
BLAW-KNOX BUCKETS - DEPENDABLE - POWERFUL - LASTING

ROAD BUILDERS' EQUIPMENT—STEEL FORMS FOR CONCRETE—FORGE & HAMMER WELDING
STEEL GRATING—CLAMSHELL BUCKETS—STANDARD BUILDINGS—STEEL BINS
STEEL PLANT EQUIPMENT—TRANSMISSION TOWERS

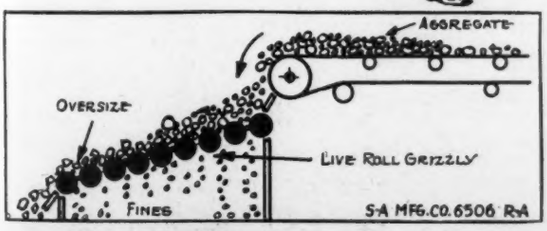
When writing advertisers, please mention ROCK PRODUCTS

The "S-A" LIVE ROLL GRIZZLY

Which Was Exhibited at the West Baden Convention of the National Crushed Stone Association, Jan. 16 to 19



S-A Live Roll Grizzly with Drive Mechanism, Case Cover Removed. At the Right of the Shaft Is Shown the Oil Circulating Pump



This Scalping Grizzly is positively non-clogging

The heaviest loads direct from a shovel will not hurt this slow-moving Live Roll Grizzly. Each revolving shaft carries solid grooved spools or rollers. The grooves in adjacent rollers match to form round openings to pass the desired size material.

As the rolls rotate in the same direction, the material travels on the ridges and is carried from roll to roll. In passing up and down over the rolls the fines settle through the openings and the lumps ride over.

Each roll turns faster than the preceding roll, preventing grinding action and eliminating any tendency for material to clog openings.

Separation is complete, capacity is high, power consumption is low and up-keep costs are negligible.

Write for Bulletin No. 149 which describes the Live Roll Grizzly in detail

DESIGNERS AND BUILDERS OF LABOR SAVING MATERIAL HANDLING MACHINERY

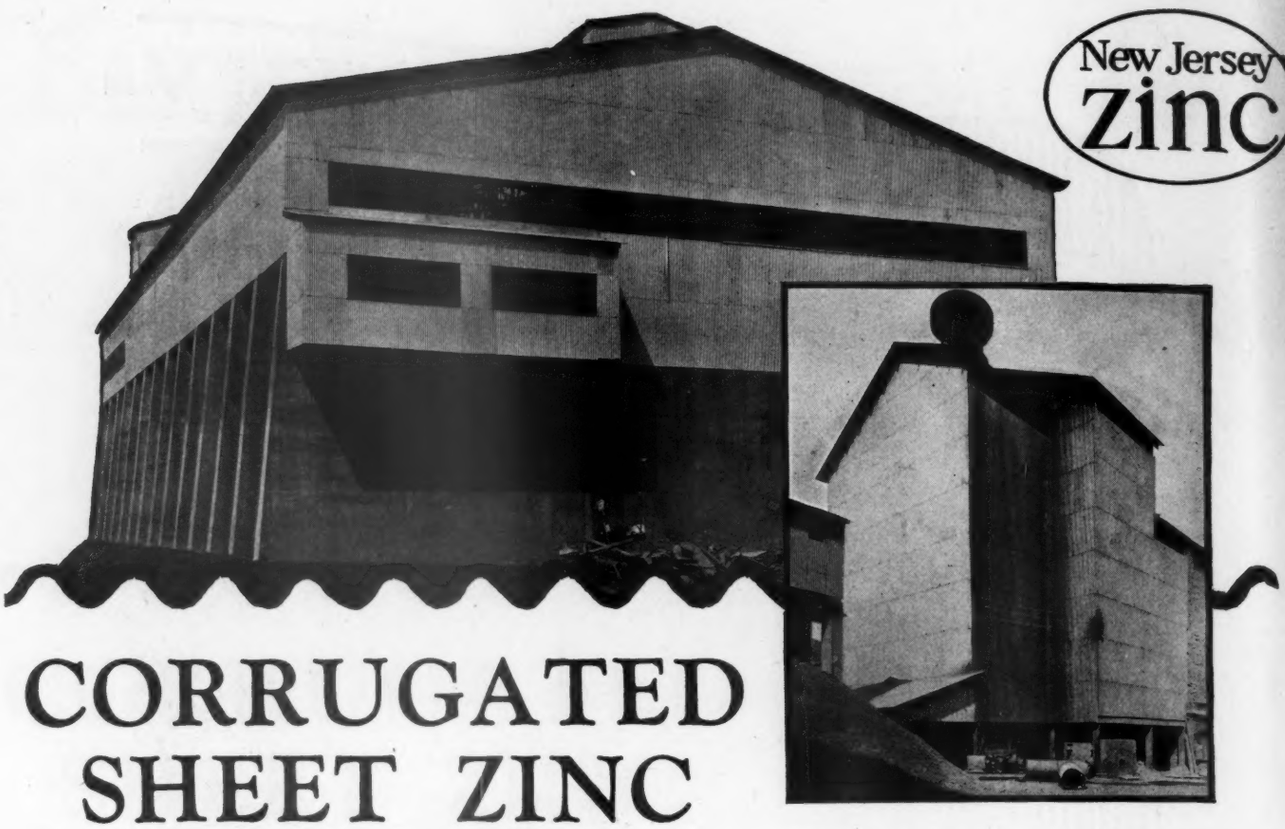
STEPHENS-ADAMSON MFG. CO. Main Offices, Aurora, Ill.
Branch Offices in Principal Cities

AURORA S-A MFG.CO ILLINOIS

STEPHENS-ADAMSON

PLANTS: AURORA, ILLINOIS — LOS ANGELES, CALIFORNIA — BELLEVILLE, ONTARIO

When writing advertisers, please mention ROCK PRODUCTS



New Jersey Zinc

CORRUGATED SHEET ZINC

Zinc Through and Through

Roofing and Siding

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Rock Products

CEMENT and ENGINEERING NEWS

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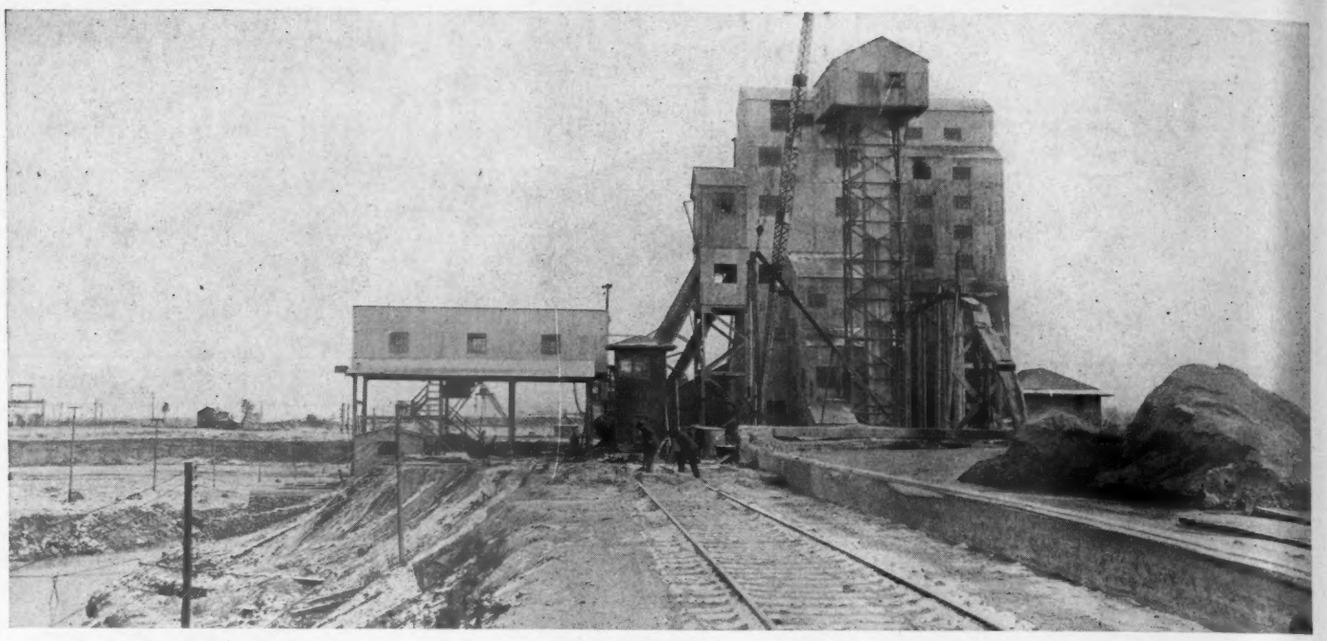
Winter quarry operations, Dolomite, Inc., Maple Grove, Ohio



The primary crushing plant is the left-hand building, and between it and the main building is the tower from which the movement of quarry cars is controlled

Dolomite, Incorporated's New Plant

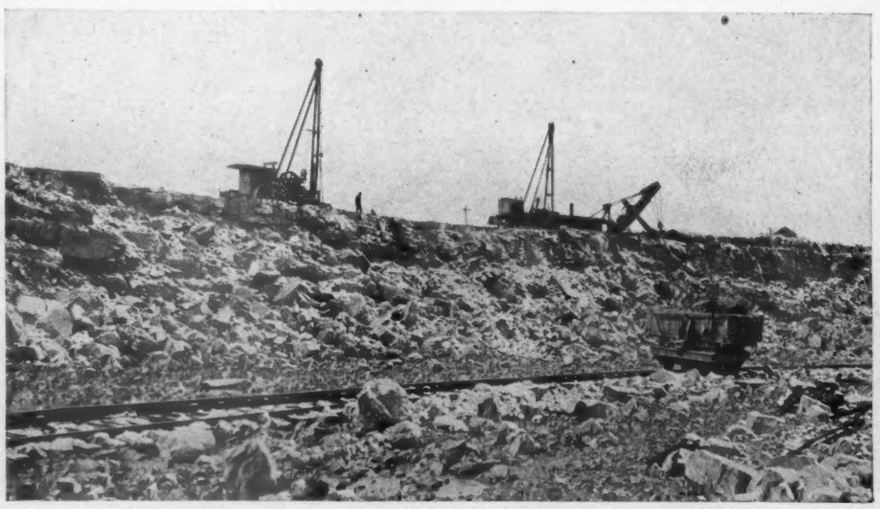
The Maple Grove, Ohio, Plant Has the Latest Refinements for Efficiency and Flexibility of Operation

WHEN the new plant of Dolomite, Inc., at Maple Grove, Ohio, was to be built, the management had fortunately recognized that a new plant would be needed in time to give the plans an unusual period of study. Data from the older operation were collected and tabulated for some time and analyzed as a basis for designing the various crushing, screening and material handling units. As a result the plant holds a first rank position among the crushing operations of the country. Also, there have been incorporated some really unique features in the design and layout of the machinery. It is perhaps as flexible an operation as has been devised for a like number of products. Any proportion of products may be made without changing the plant in any way, and with only the limitations imposed by the initial breaking of the stone.

Perhaps the best feature, in the light of the ever increasing demand for the smaller sizes of crushed stone, is that the output of the plant remains at the same tonnage whether the product is crushed to the usual 6-in. and finer or to anything down to 1-in. and finer. And the variations in the size of product may be had with no change in the crushing and screening equipment, and with no additional cost, except that for the power and upkeep required for the added load on the recrushing and conveying machinery.

The need for this feature came from a study of the former plant which showed that when the product was all crushed to 1½-in. and finer instead of the usual 6-in. and finer the output was cut to almost exactly one-half.

As the replacing of old plants by new has been, and probably always will be, one of the problems of the crushed stone industry, it may be worth while to devote a little attention to the various stages through which this particular plant has passed. Originally it consisted of a primary and secondary crusher and simple screening equipment. The primary, a 48x60 Power and Mining Machinery Co. jaw crusher, took everything that came from the quarry and the discharge went to a No. 10 McCully crusher by a 42-in. pan conveyor. The discharge of the No. 10 was then elevated to a revolving screen above a set of bins, the oversize of the screen being returned in the usual way. This arrangement is shown in Flow Sheet No. 1.

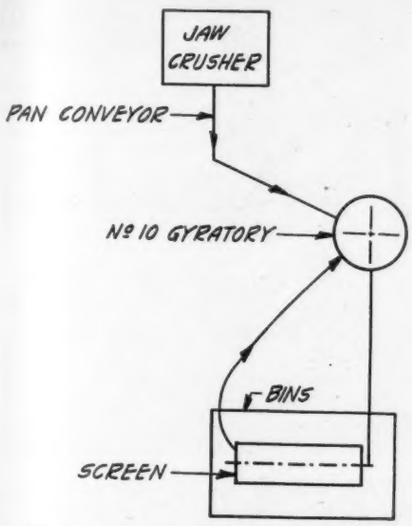


The quarry face and one of the third-rail quarry cars passing

The market increased and the de-

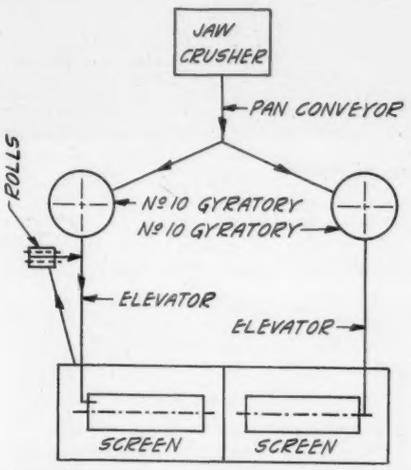
mand for fine sizes increased. To meet both demands a second No. 10 crusher of the same type was installed, with another rotary screen and bins, and a set of rolls was placed to recrush part of the product and return it to the elevator to the screen. This arrangement is shown in Flow Sheet No. 2.

With increased demand for fine sizes, necessitating more product from the rolls, it was found that the limit of the plant was the elevator load which could be carried from the second No. 10 crusher and the rolls. To increase the handling capacity a most unusual step was taken. A Stephens-Adamson pivoted carrier was put in, paralleling the bins, and a belt was run to it from the rolls. A live roll grizzly was provided to scalp the jaw crusher discharge and one of the No. 10 gyratories was rebuilt and placed so that the discharge would fall into the pivoted carrier. The carrier was arranged so that it could discharge to both rotary screens if necessary. As the need for an even feed had been recognized, a receiving bin was placed before the replaced gyratory crusher and a feeder put before the crusher. This arrangement is shown in Flow Sheet No. 3, and it will be noted that it does not differ materially from that of a good many crushing plants except in the use of a pivoted carrier to do the conveying.



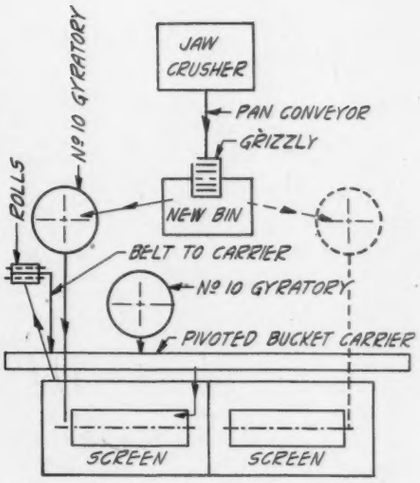
Flow sheet No. 1 showing original plant layout

Of this old plant there remains today only the jaw crusher and pan conveyor, one of the No. 10 crushers and the pivoted-carrier. Bins, screens, foundations and buildings have all been replaced by new ones and improved devices have taken the place of the older ones. And this change to an entirely new plant, so new that hardly a vestige of the old plant remains, was made without seriously interrupting production, and without shutting down more than two or three days at a time, just long enough to make the necessary connections to the newly installed machines. In addition to keeping up with production, the heavy investment in the jaw crusher and pan conveyor was preserved, the problem of the circulating load was solved and feeders placed everywhere that they were needed secured an even load for every machine.

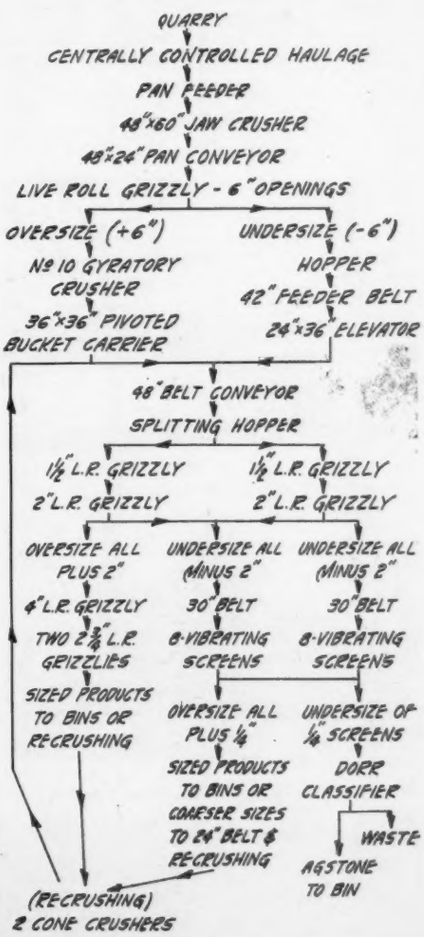


Flow sheet No. 2 showing additions for increased capacity and finer crushing

But before this was achieved much preliminary work had been done. Fragmentation charts, drawn from actual crushing data, gave the percentage of each size produced and these percentages were placed on various flow sheets to show what the load would be on every machine. From these flow sheets a choice was made so that simplicity and compactness were combined with a properly balanced load, and the plant design followed.



Flow sheet No. 3 with changes to give greater capacity for fine sizes



Flow sheet of new plant

Actual construction was begun in November, 1926, and the new plant was ready in its present shape in July, 1927.

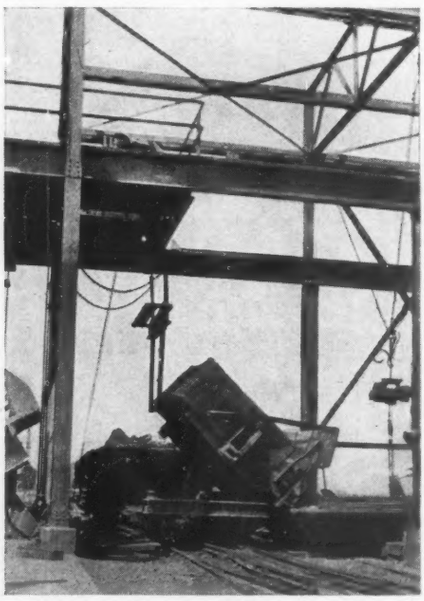
Looking over part of the 115 acres of quarry. This entire area may be worked again to a depth of about 100 ft.

Quarry Practice

The quarry is an old one and about 115 acres have been excavated. It is of a roughly

Storage piles near the plant

oval shape occupying the greater part of a triangle bounded by the main line of the Nickel Plate railroad on one side and by highways on the other. The face is carried at 35 to 40 ft., but this is merely a convenient working height. The rock extends for at least 100 ft. below, so that lower benches may be opened after the present area is worked over. The rock is the Niagara dolomite, well-known as the source of the famous Woodville plastic hydrates. No lime is burned at this plant, although a portion of the product is burned to dolomite clinker which is sold for lining open-hearth steel furnaces.



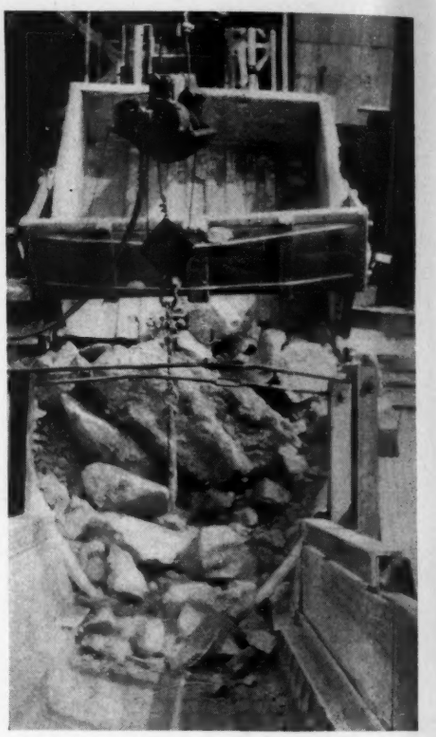
Car dumping to crusher feeder

There are two Sanderson-Cyclone and two Loomis drills used in putting down well-drill holes and the holes are carried only a short distance below the quarry floor. Sixty per cent powder is used in the bottom and a charge of 40% powder is placed about half-way, and all holes are shot with Cordeau-Bickford. Fragmentation is good. What few large pieces are found to need secondary shooting are placed behind the shovel and drilled with Ingersoll-Rand jackhammer drills.

The rock is loaded with a 120-B Bucyrus shovel, which is of the full revolving type and caterpillar mounted. This has proven a very satisfactory machine for the work. The company has three other Bucyrus shovels, a No. 70, which is used in stripping; a 30-B, used in side-casting strippings, and a No. 95 railroad type, which is now held as a reserve. Two saddle tank, standard gage locomotives, a 20-ton Davenport and a 25-ton Porter are used to haul away the strippings.

It is the opinion of those in charge of this quarry that the introduction of such large shovels as the 120-B, with large capacity and the flexibility of movement given by the full revolving feature and the caterpillar tread, is the main advance in quarry practice that has been made in recent years.

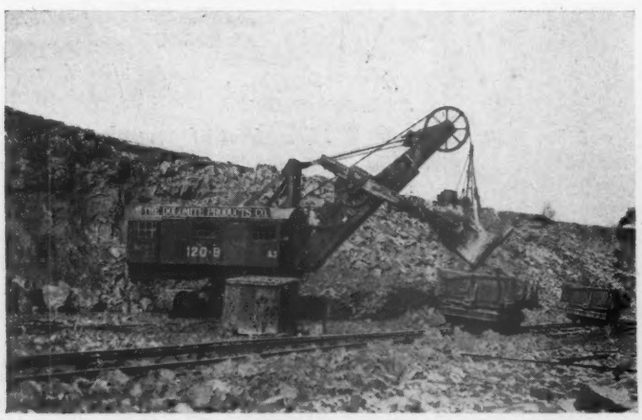
Haulage in the quarry is by the Woodford centrally controlled electric haulage system.



Front view of car dumping to feeder

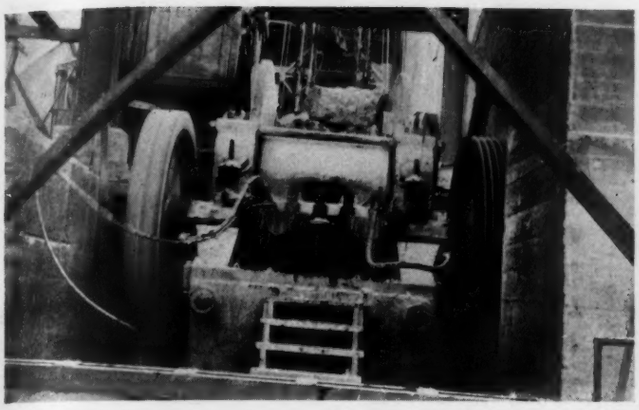
It follows around the quarry face, cars passing the crusher and dumping and going on in the same direction to the shovel. There are two towers, one at the primary crusher, which controls the car dumping and the cars on the line, and another in the center of the quarry that spots the cars at the shovel. The car dumper is of the usual type used with the Woodford system.

The Woodford system was installed in

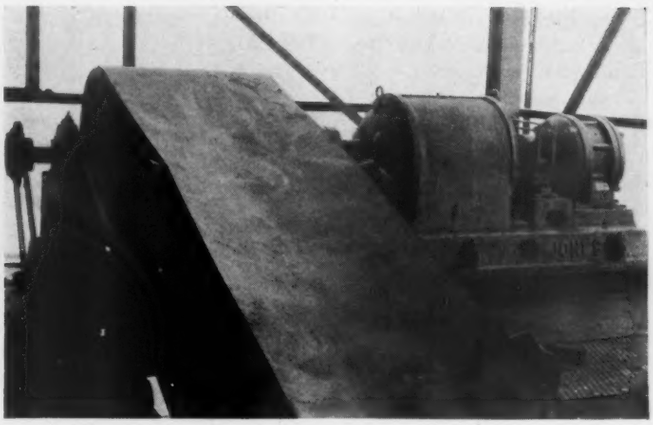


Shovel filling the 15-ton third-rail cars

Stripping and drilling above the quarry face



The 48x60-in. primary crusher



One of the main conveyor drives

1913 and has proven very satisfactory in its long term of service. A great advantage of the system has been its ability to handle a greatly increased load without any changes except the purchase of more cars to correspond with the increased output of the plant.

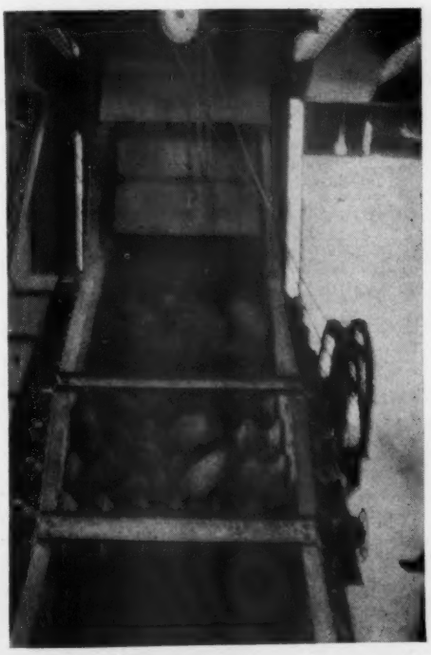
Primary Crushing

The primary crusher is the 48x60-in. jaw crusher already mentioned. The cars do not dump directly into it but to an apron feeder which is 22 ft. long and 60 in. wide. This is driven by a 40-hp. motor and a Cleveland worm gear speed reducer.

The drive of the primary crusher is unique, for the crusher is connected to a 200-hp. motor by a Link-Belt 16-in. silent chain. Even the makers of the chain had some doubts about its practicability for this purpose, but it has been found better in every way than the rope drive which it replaced.

Above the primary crusher is a Milwaukee electric traveling crane for handling large stones which replaced an A-frame and air hoist. The advantage of the traveling crane is that it can handle a big rock in the car or on the feeder as well as at the crusher, and since it was installed it has never been necessary to shoot a rock anywhere near the crushing plant.

The crusher discharge falls into a Stephens-Adamson pan conveyor that has 48x 24-in. buckets and is 125 ft. high. It is driven by a 100-hp. motor through a three-gear reduction and an 8-in. Link-Belt silent chain. The conveyor is fitted with a De Laval clutch and Cutler-Hammer magnetic brake built in one unit. This prevents back running and this same device is used on all the plant elevators.



The roll grizzly with 6-in. round openings

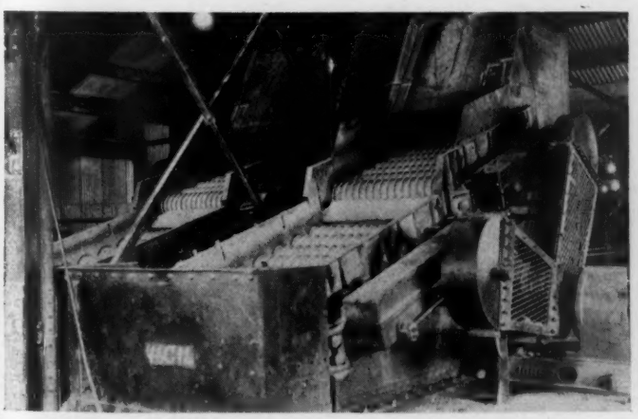
From the conveyor the rock goes to a Stephens-Adamson live roll grizzly, which has eight 16-in. rolls arranged to give 6-in. openings. It is said to be the grizzly with the largest openings that has been built of this type. It is driven by a 10-hp. motor through a Jones spur-gear speed reducer and a Tex-rope drive.

Coarse and Fine Screening

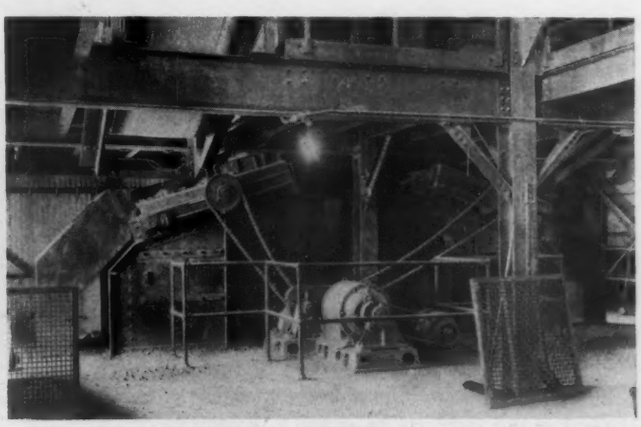
This grizzly makes an oversize, all greater than 6-in. diameter, and an undersize, all passing a 6-in. round hole. (Provision has been made at this point to install another live roll grizzly for making kiln stone from the oversize.) The course of the undersize will be followed first in this description.

It goes to a 50-ton steel hopper with a gate that opens on a 42-in. belt feeder of 6 ft. 7 in. centers, driven by a 5-hp. motor through a Jones speed reducer (180 to 1 reduction). This is direct-connected to the head pulley. The hopper has an electrically operated device which sounds a siren at the crusher when the hopper is full.

The feeder belt delivers to a 24x36-in. vertical elevator of 60 ft. centers in a steel casing. It is driven by a 50-hp. motor and a Palmer-Bee speed reducer (9.17 to 1 ratio) connected to the gear shaft of the head pulley.



Roll grizzlies with 1 1/2- and 2 1/2-in. openings, in series



Roll grizzlies are driven through a speed reducer and chains

The discharge of this elevator falls on a 48-in. belt conveyor 85 ft. long. The drive is a 20-hp. motor and Jones speed reducer (24 to 1 reduction), the reducer being direct connected to the pulley. This conveyor, like the elevators in the plant, is fitted with a Cutler-Hammer brake built in a De Laval coupling for quick stoppage in case of emergency. The hopper into which this belt discharges has an arrangement for splitting the stream into two lines of flow, and each line has the same screening and handling equipment.

Each of the two streams from the hopper goes to a 1½-in. Stephens-Adamson live roll grizzly followed by a 2-in. grizzly of the same type and make. All four grizzlies are of the seven-roll type and the rolls are 9 in. in diameter and 42 in. long. The drive

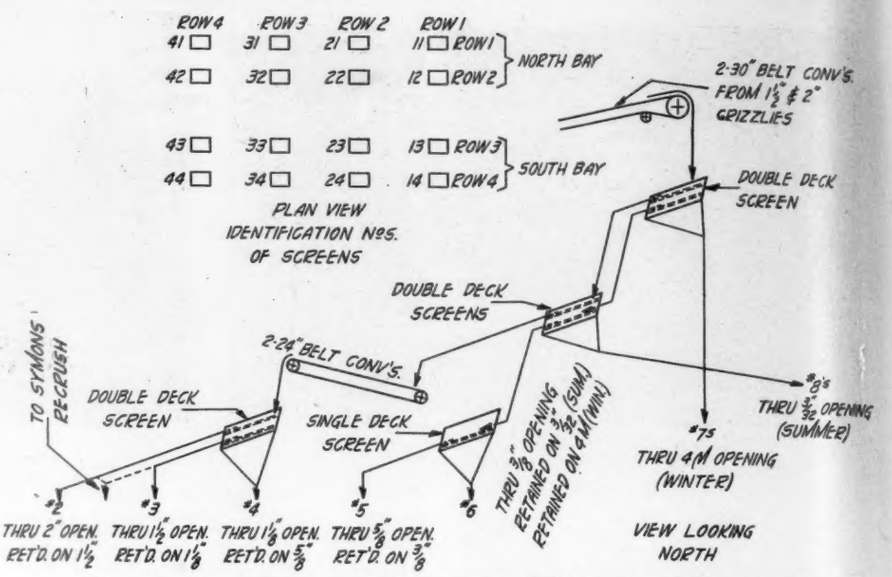
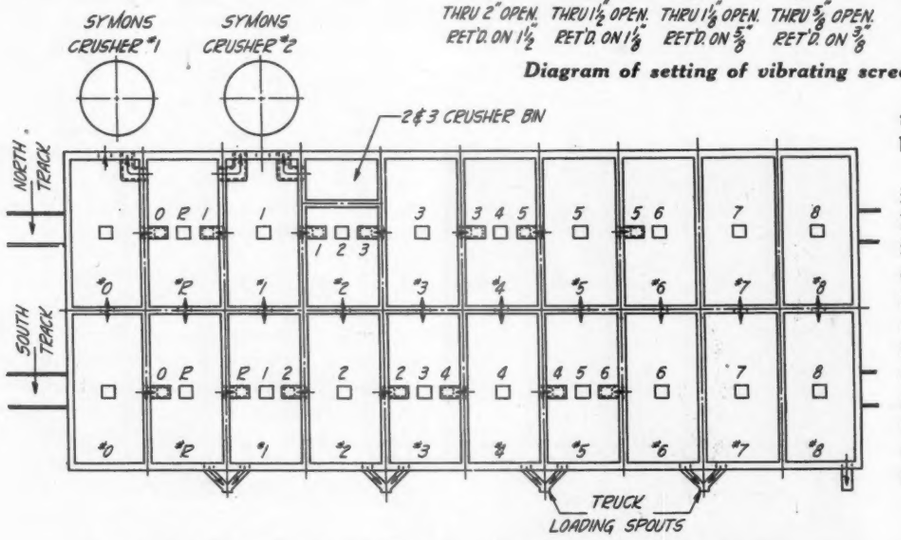


Diagram of setting of vibrating screens and flow of material over them



Plan of bins. Note the small recrushing bins near fine crushers

of each pair of grizzlies is a 7½-hp. motor connected to a Jones speed reducer (21 to 1 reduction) and this is connected to a double sprocket with a chain to each grizzly.

The throughs of all grizzlies go to two 30-in. belts of 85-ft. centers, one for each pair of grizzlies. These take the throughs to the fine screening plant.

The oversize of the 1½ and 2-in. grizzlies fall down a chute to a 4-in. live roll grizzly, driven by a 7-hp. motor through a Jones speed reducer of 20 to 1 ratio. This has six rolls and is 60 in. wide. The oversize, known as No. 0, is all through 6-in. and on 4-in. round openings and is sent to bins.

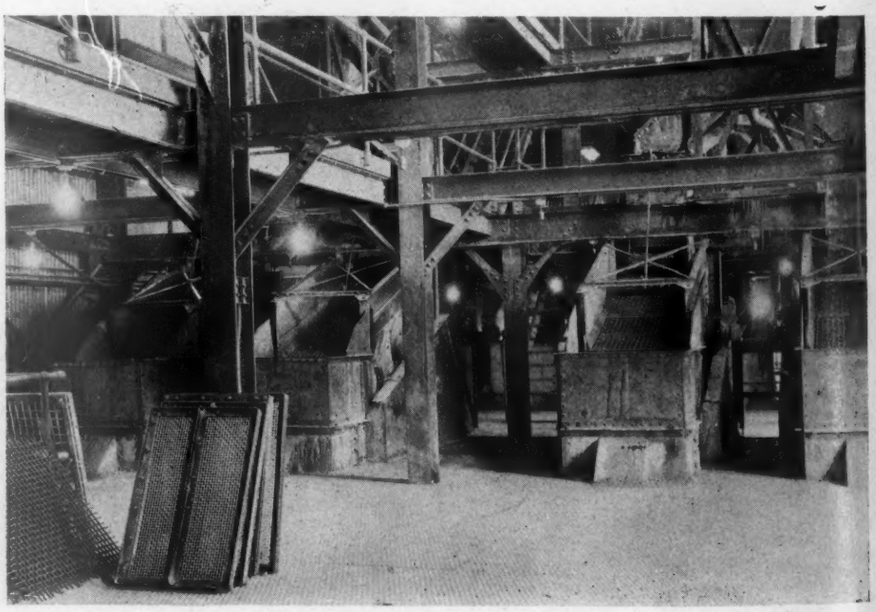
The undersize (from 4-in. to 1½-in.) goes to two 2¾-in. grizzlies. These are 42-in. wide and each has seven 9-in. rolls. Both are driven by one 7½-hp. motor. The oversize (from 4-in. to 2¾-in.) and the undersize (2¾-in. to 1½-in.) are both sent to bins.

Coming back now to the throughs of the 1½-in. and 2½-in. live roll grizzlies, which were mentioned as having been sent by two 30-in. belts to the fine screening plant. The screens in this plant are all Niagara vibrating screens driven by 2-hp. motors (1700 r.p.m.) through Tex-rope drives. The Tex-rope drive has step sheaves so the speed of the screen may be speeded from 1200 r.p.m. to 1450 r.p.m. Lower speeds, however, have been found more efficient.

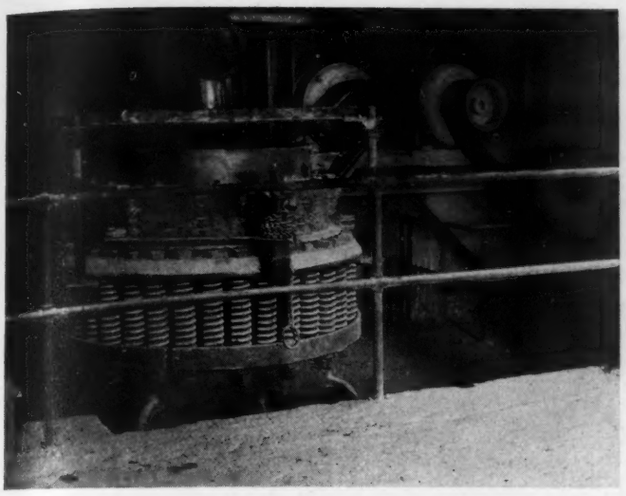
There are 16 screens and they are placed in two bays, each fed by one of the 30-in. belts referred to. The first pair of screens in each bay are double-decked with ⅝-in. openings above and 1¼-in. or 3/32-in. openings below, according to the season. The second screens are like the first pair being installed to insure very complete removal of the fines. The oversize, from 1½-in. to ¼-in. goes to a ⅜-in. single-deck screen and the undersize is sent to bins. The oversize is sent to a single-deck ½-in. screen and both oversize and undersize are sent to bins.

Washing the Stone

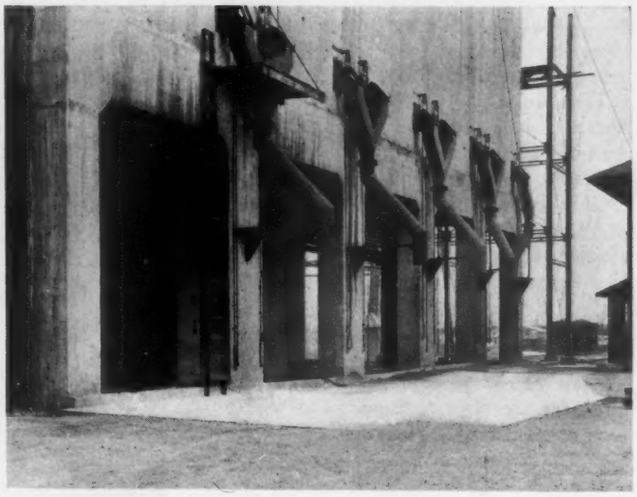
In common with most of the recently built crushing plants, this plant has arrangements for washing all the fine sizes of stone. Water is applied at the upper pairs of Niagara screens in both bays and it carries the



The lower rank of vibrating screens



One of the fine crushers with short center rope drive



Bins with swinging metal spouts for loading trucks

fines through these screens (either ¼-in. or 3/32-in.). Water and fines flow to a Dorr bowl classifier which is placed on a platform outside the plant. The overflow of the classifier is sent to two settling basins in a block 225 ft. long and 75 ft. wide. A further basin 325x75 ft. is provided. From this the overflow goes to waste.

These basins are of concrete. The fines that settle in them are dug out by locomotive cranes and loaded on railway cars to be sold as agricultural limestone. The oversize from the classifier which is all minus ¼-in. is collected in a bin and sold for agricultural limestone.

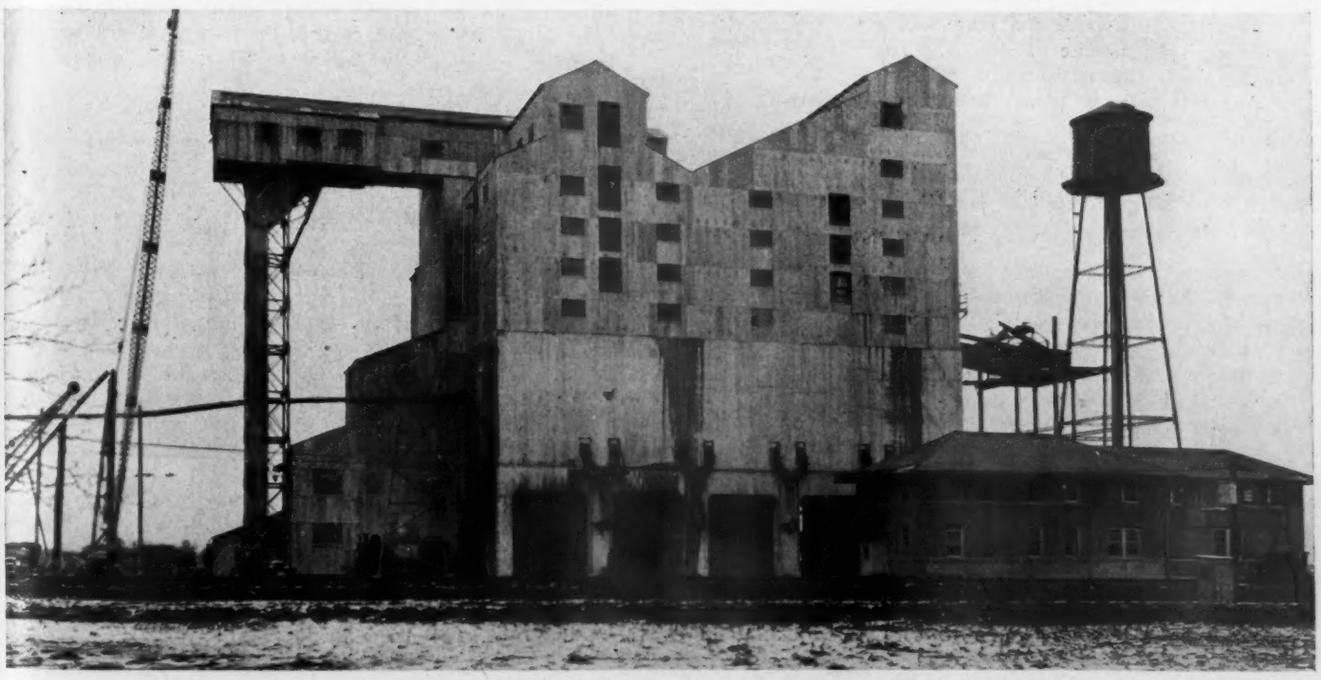
Water is supplied by a 6-in. Allis-Chalmers pump which pumps into an 8-in. line. It is direct-connected to a 50-hp. motor.

Secondary Crushing

This completes the course of the undersize of the live roll grizzly with 6-in. openings. The oversize, all greater than 6-in., follows the same course after it has been crushed and elevated by the pivoted bucket carrier, as will be described later. For crushing, the oversize falls by gravity to a 10-in. McCully gyratory crusher driven by a 100-hp. motor, normally running at 450 r.p.m. but of the variable speed type so that the speed may be regulated to suit the feed. The drive is through a Tex-rope drive of nine 1½x1-in. strands.

The crusher discharge falls into the Stephens-Adamson pivoted bucket carrier with 36x36-in. buckets. The horizontal run on this carrier is 80 ft. 1 in. and the vertical lift is 95 ft. 9 in. Its speed is about 60 ft. per minute and it handles the plant output of 500 tons per hour plus the circulating load. The drive is by a 75-hp. motor, a gear train and a Morse 8-in. silent chain. It discharges on the 48-in. belt that has been mentioned as taken the undersize of the 6-in. live roll grizzly to the 1½-in. and 2½-in. live roll grizzlies.

This carrier is an unusual piece of equipment for a crushing plant, and it was included in the design largely because it permitted a replacement of the old secondary elevators without interrupting operations. It handles all the stone which is crushed a second or third time. It not only takes the discharge of the 10-in. crusher mentioned but that of the recrushing department as well. It is also connected with the bottom of the 36-in. elevator so that the buckets never have to dig out the boot. And it has some unexpected uses, such as recovering the contents of cars that have to be unloaded. These are run over a track hopper and dumped, and from the hopper the carrier takes the material back to the bins



Side view of main building. The pivoted bucket carrier shows at the left. Office building at right

through the plant.

Recrushing Plant

The recrushing arrangements are extremely simple and this is largely due to the presence of the pivoted bucket carrier with its large capacity, which handles the recrushed material.

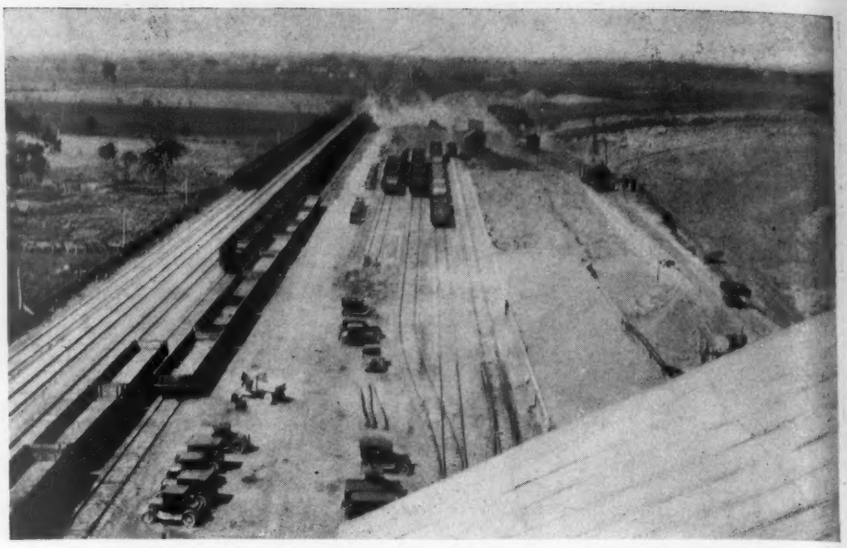
All the recrushing is done by two Symons cone crushers which are fed from the plant bins through simple chutes. The output of each of these machines under normal conditions, working on average size material, is about 150 tons per hour, so it will be seen that the recrushing capacity is exceptionally large for the plant tonnage. The drive of each crusher is a 100-hp. motor through an 8-strand Tex-rope drive.

The feed flows from the regular plant bins to these crushers except such feed as comes from the lower screens in the fine screening plant. This is normally sent to bins too far from the recrushers for a gravity flow, so a special bin has been put in close to the crushers to receive it. The bin is filled by a 24-in. belt, 27 ft. centers, that passes under these screens.

Bins and Loading Arrangements

The bins are of concrete, well reinforced, and there are 20 of them, each 10x16 ft. and 26 ft. deep. Both railroad cars and trucks may be loaded from them. The gates for car loading are pneumatically operated and electrically controlled, the method of doing this having been worked out by Walter Patnoe, the plant manager and chief engineer. There is a simple gate that is set to deliver the required amount and a second sliding gate which is pulled back and forth by a Curtis air hoist laid horizontally. The admission of air to the hoist is through magnetic valves arranged for remote control. One gate can control the flow from one, two or three bins in a group and hence load a single size or a mixture of sizes. By setting the simple gates at the bin, the mixtures of sizes may be made of any desired proportions.

Trucks are loaded through gates that are electrically operated and open into flexible metal pipes. By turning two or more of these pipes together almost any mixture of sizes may be loaded.



Tracks and storage on west side of plant

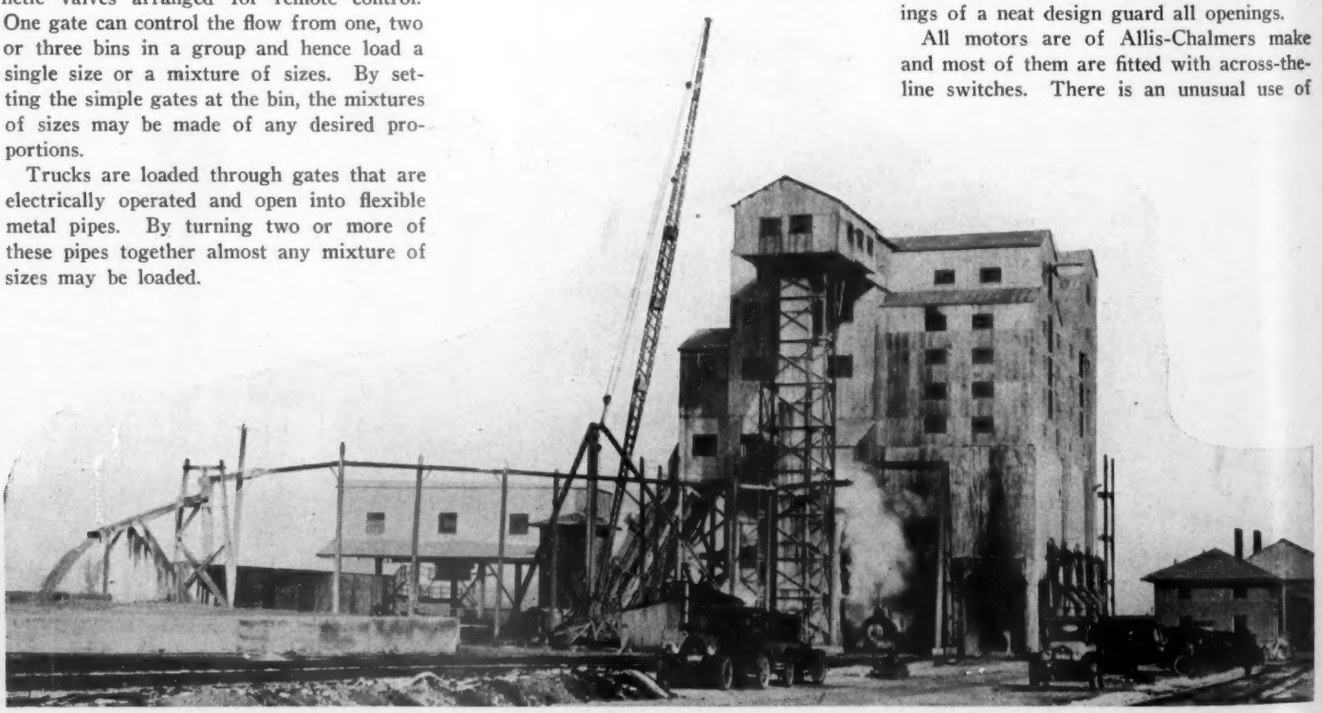
Storage is carried in stockpiles placed along the track. Material is handled in and out of them by two locomotive cranes, one Browning and one Brownhoist, which also do some car-switching work. A 50-ton Porter saddle tank locomotive is used in car switching. A Blaw-Knox steel bin is placed at the stockpiles for truck loading.

Notes on Design and Construction

This is a remarkable plant in the care and attention that have been given to the details of design and construction. Every elevator and some of the conveyors are provided with a magnetic brake and clutch to prevent back running and to permit emergency stops. Every chute is provided with a safety gate and limit switch that instantly warns the operator of a choke in the machine below. Some of the bins have devices to show full bin and all the bins will have it before long.

Spouts and chutes are of high carbon steel lined with either rubber or manganese steel. Rubber is preferred where it has only to meet attrition, as it makes for less noise in the mill. Where there is an actual drop of material in passing from one chute to another manganese steel has been found better to resist impact. "Farrell 85" alloy is used on the wearing parts of the pivoted bucket carrier and has been found satisfactory in reducing upkeep. Safety devices are placed everywhere that they should be and pipe railings of a neat design guard all openings.

All motors are of Allis-Chalmers make and most of them are fitted with across-the-line switches. There is an unusual use of



The concrete tanks in which fines from the overflow of the classifier are settled shows at the left

Tex-rope drives and speed reducers as the foregoing description shows. Diamond roller chain and sprockets are used on the chain drives. The conveying machinery, most of which was furnished by the Stephens-Adamson Co., has this firm's "Sacon" self-aligning ball bearing carriers.

There are no special dust collecting devices, but the operation of the plant is practically dustless, as washing the stone begins with fairly large sizes of stone. The elevator and pivoted carrier, from which some dust might escape, are well housed.

The building is of structural steel framing covered with Armco iron, with all foundations of concrete. Pipes and electrical connections in some cases are carried in well-constructed concrete lined tunnels.

The company maintains a small village of houses (called Narlo) near the plant, but many employes live in Bellview and Tiffin, and a bus line is run by the company for the convenience of those of the office force who do not have their own cars. An excellent restaurant is provided for employes.

The plant is the result of several years' thought and study on the part of H. B. Eells, Jr., president of the company, and W. W. Patnoe, general superintendent and chief engineer, and of the engineering ability of Mr. Patnoe.

George Stone is assistant to Mr. Patnoe and W. H. Cameron is the quarry superintendent.

Plastic Magnesia Cements*

FIRST accounts of the reaction between magnesium chloride and magnesium oxide which results in a dense, hard and strong product were published by Sorel, who also applied for patents on what he called "magnesium oxychloride cements." Widely different formulas were proposed for the reaction in which the ratio of $MgCl_2$ to MgO varied from 1:1 to 1:10 molecules. Difference in testing conditions were probably responsible for the varied results. Recent investigators have reported that the reaction between MgO and $MgCl_2$ using solutions of 18 deg. and 35 deg. Baumé, develops the same oxychloride and its formula is $3MgO \cdot MgCl_2 \cdot 10H_2O$. In all probability the final reaction is actually a solid solution in which magnesium chloride, oxide and hydroxide all exist in addition to the oxychloride crystals.

The most common present-day source of magnesium oxide for these cements is the rock commonly called magnesite, which is magnesium carbonate in its natural state, contaminated with more or less silica, lime and iron and aluminum oxides. Deposits of magnesite are found in many parts of the world. The most important from the commercial standpoint are those located in California and Washington in this country and India, Greece and Austria. It has often been proposed to utilize the many large deposits of dolomite (combined magnesium and calcium carbonates in natural state) for production of magnesia, and many patents have been issued on the subject.

In preparing the magnesite for use, the first step is calcination, which removes the carbon dioxide from the magnesium carbonate. This process is carried on in shaft or rotary kilns. The burning conditions are accurately controlled, since the physical properties of the cements made from the oxide are dependent on the correct calcining conditions. If magnesite is heated to higher temperatures and for longer periods of time than are required to produce a material suitable for use in magnesia cements, it approaches a "dead burned" condition, which is the type of product employed in the form of blocks and bricks for many furnace and kiln linings. As used in the Sorel reaction, the oxide is in the condition known as caustic or plastic calcined magnesia. This term gives rise to the name "plastic magnesia cements," which is often used instead of the longer description, "magnesium oxychloride cements."

Before the plastic magnesia can be used in stucco, flooring or other cement products, it must be very finely ground; in a good commercial product 75% or more will pass a 200-mesh sieve.

Physical Testing

The physical tests of magnesia cements usually include determination of strength, time of set and volume change. Standard briquets similar to those used in portland cement testing are used to ascertain tensile strengths. The Gilmore needle is satisfactory for determining the time of set and the linear expansion or contraction between initial set and 24 hr. Age can best be measured by the Berry strain gage. Weathering or water resistance of the cement is determined under conditions which involve to a more or less extent, leaching effect of rain.

Chemical analysis determines the suitability of the calcium chloride, but for the magnesia physical tests of a mixture containing some of the material are also necessary. One of the most important items in chemical analysis is the combined and absorbed moisture in the magnesia, which is determined by subtracting the carbon dioxide content from the ignition loss. The quantity is indicative of the aging or exposure to moisture to which the magnesia may have been subjected. When hydrate water exceeds 5%, strength and setting time of the cement are likely to be affected, and also abnormal shinkage may result during hardening.

Free lime and calcium compounds, probably silicates, which react with the $MgCl_2$ solution to form $CaCl_2$ are detrimental to plastic magnesia, so it is advisable to determine the lime which is soluble in a dilute $MgCl_2$ solution. By adding to the cement solution the theoretical amount of $MgSO_4$ equivalent to the small amounts of lime, the difficulties are eliminated.

Uses

The greatest amount of magnesia cements is used for exterior stucco where it is applied over a suitable backing. It is popular with architects, for it permits unusual design and stands weathering. Additional features are its fireproof nature, elasticity, insulatory properties and ease of application. Many beautiful effects have been achieved with it in public buildings.

Because of the great strength and binding properties of magnesium oxychloride, it is an ideal material for cementing together tough and fibrous fillers to form a resilient, wear-resisting floor. The first of such floors was installed in this country more than 20 years ago, and as time has passed the technic of both manufacture and installation has been improved, until today architects and builders recognize magnesia composition flooring as a standard type which possesses many merits. Chief of the advantageous qualities of these floors are their resiliency, sanitary properties and attractiveness.

Interior wall plasters, with magnesia cement as the binder, have been used with decided success. They cannot compete in price with the ordinary lime or gypsum plasters, but in buildings of highest quality the formation of many fine cracks, such as are common in ordinary plasters, may be eliminated because of the strength, elasticity and toughness of these cements.

Floor and wall tile, both cast and pressed, are being prepared from these cements with very satisfactory results. Statuary and other ornamental ware have likewise been cast with excellent results. Magnesia cements are particularly adaptable for casting because they have a slight tendency to expand in the molds during setting, thereby accurately reproducing even the finest lines of the mold. A very fire-resistant paint to be applied over wood surfaces may be made with oxychloride cement as the binder.

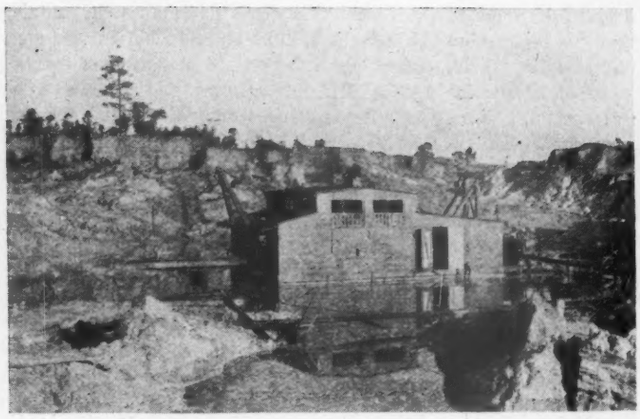
*Abstracted from *Industrial and Engineering Chemistry*, (1927) 19, 1139-44.

CHEMICAL ANALYSES OF TYPICAL SAMPLES OF COMMERCIAL PLASTIC MAGNESIA

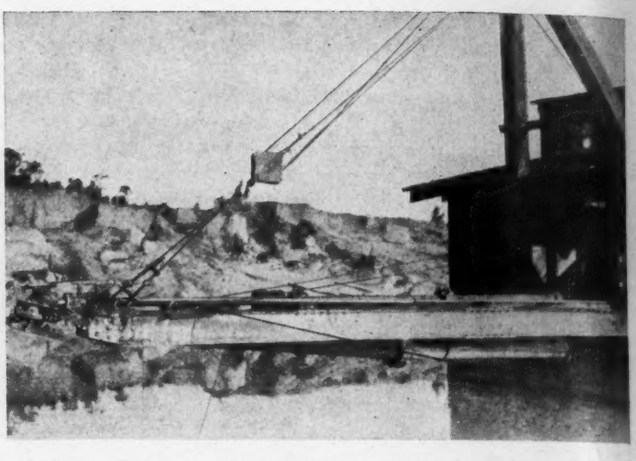
(Figures in per cent)

	California	California	Washington	India	Greece
Ignition loss	5.07	6.55	5.67	6.00	4.87
Silica	2.53	5.37	8.21	5.64	2.65
Iron and aluminum oxides	0.40	1.60	2.45	0.25	0.59
Lime, total	2.38	2.64	1.57	1.54	1.58
Magnesia, total	89.65	83.40	82.28	87.12	90.21
Lime, active*	1.57	0.31	1.41	1.16	0.27
Lime, water-soluble	0.38	0.08	0.32	0.24	0.09
Carbon dioxide	2.63	0.87	2.15	1.54	0.66
Water, combined and absorbed†	2.44	5.68	3.52	4.46	4.21
Magnesia, free†	83.84	70.93	73.66	76.90	81.01

*Lime soluble in 1% solution of $MgCl_2 \cdot 6H_2O$ when shaken 24 hours. †Calculated.



Stern of dredge and face of the deposit left by sluicing



Ladder of structural steel that supports the rotary cutter

New Dredge of the Atlanta Sand and Supply Company

Deposit of Layers of Sand with Layers of Kaolin Offers an Unusual Problem

THE Atlanta Sand and Supply Co. of Atlanta, Ga., works a deposit of sand at Gaillard, Ga. Up to the present year it hydraulicked the hills of the deposit, washing the material in a very simple way, by running it with water into open top cars arranged with an overflow gate to turn the car into a settling box. The product prepared in this simple manner was satisfactory to the trade, and experiments made at "Georgia Tech" showed that it was an exceptionally good fine aggregate for concrete.

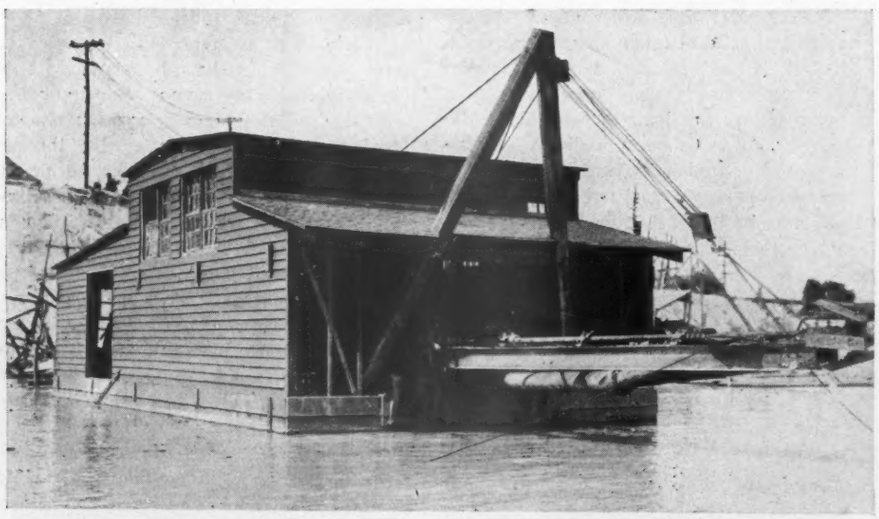
But the limit for hydraulic working could be seen at the beginning of the 1927 season, and another method had to be chosen. After a thorough discussion of different methods of excavating the deposit it was finally decided to put in a dredge.

Deposit

The deposit is very different from the deposits of the glaciated area, which are so much worked for sand and gravel in the northern states. It is all sand, any pebbles being those that might have been accidentally included when the deposit was laid down. The sand in the lower part is practically pure quartz, many of the grains appearing to be fragments of quartz crystals. The range of grain sizes is rather limited, sizes around 10-mesh predominating. But the sand as marketed has a fineness modulus around 2.7. The lines of seasonal flows can be plainly seen on the sides of cuts through the deposit, and in some cases these lines have been bent and folded, presumably by earth movements. Geologists in that part of the country say that such deposits are probably from quartz veins which were freed by the disintegration of the old rocks on the edge of the Piedmont plateau.

The sand would require no preparation for the market if it were not for layers of kaolin that were laid down with it. These layers cannot be avoided in working and they break up into clay balls and also coat the grains with a clay film. Hence the necessity for washing, with the added advantage of bringing a mixture of sizes to the car, when hydraulicking is employed.

The method of hydraulicking was briefly described in the issue of May 28, 1927. It was perhaps two months earlier that the dredge began building. Along in July of 1927 the change was made to dredging and this method has since been regularly employed.

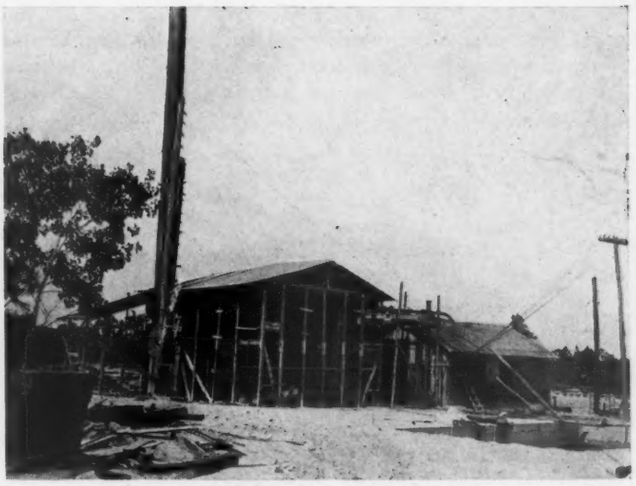


Entire deck is covered with a house. This adds to the life of dredge by preventing decay

Dredge

The dredge equipment was designed by Jean M. Allen of Chicago, the other engineering being by the company's own engineers. The hull, built by the company, on the ground, is 39 ft. 6 in. long and 20 ft. wide. It is 3 ft. deep and draws about 2 ft. Clear stock southern pine was used throughout in its construction. The main (8 in.) pump was made by the American Manga-

Dredge being constructed on ground that has been sluiced



The new power plant (photographed during construction)

nese Steel Co. It is mounted aft on the center line of the hull and connected to a 150-hp. General Electric motor by a 20-in. belt. The suction passes around the motor by a series of long radius bends and goes to a 20-ft. ladder which holds the rotary cutter. This was especially designed by Mr. Allen to cut through the layers of kaolin. Originally a cutter of the ordinary removable blade type was used, but this showed a tendency to clog with lumps of kaolin so an open cutter of the type shown in the illustration was substituted.

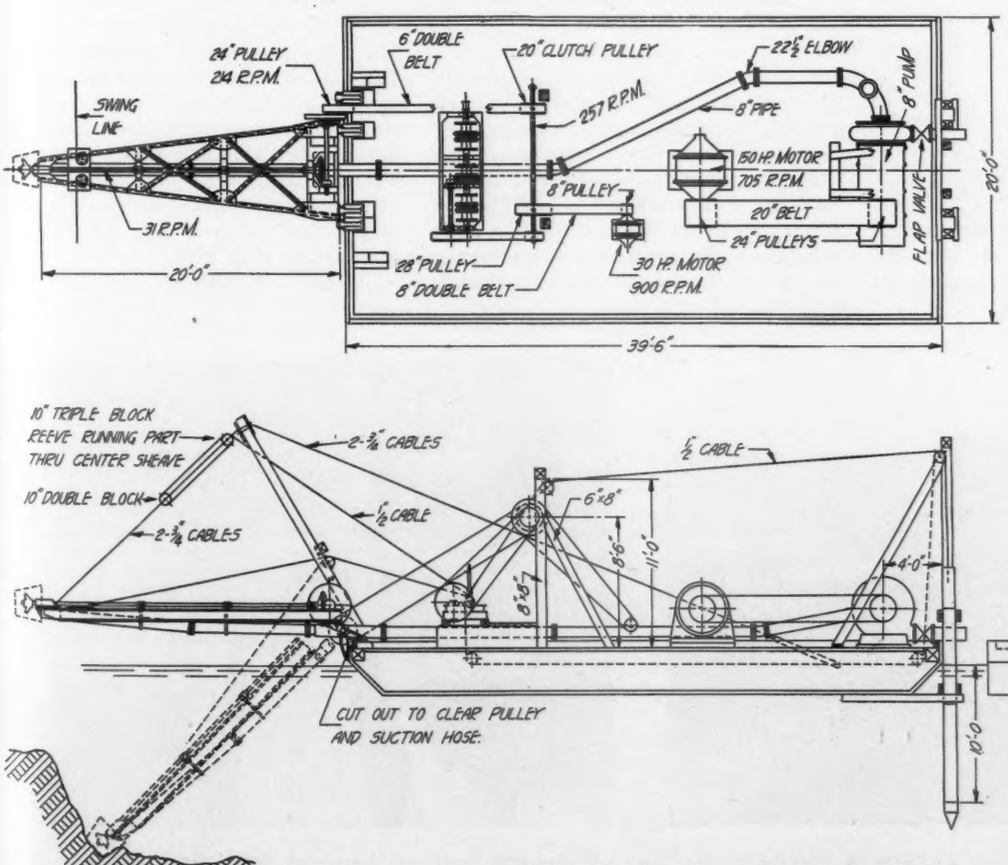
The motor has a 24-in. pulley and a 21-in. pulley was placed on the pump originally. Later a 24-in. pulley was placed on the pump, which enabled the motor to run up to its rated speed and develop full horsepower. The cutter makes 31 r.p.m.

The cutter and the five-drum hoist which handles lines and spuds (also designed by Mr. Allen) are driven by a 30-hp. motor running at 900 r.p.m. The motor drives a countershaft placed 8 ft. 6 in. above the deck and the cutter and hoist are driven from the countershaft by belts. The hoist has all five drums on one shaft, with clutches for releasing. The center drum handles the suction, the drums on either side the swinging lines and the outside drums the two spuds which are 10x10 timbers 16 ft. long shod with iron points.

The cutter ladder is relatively short, but this is because the water level may be controlled. The deposit is above the river, but a thick stratum of kaolin holds the water which is pumped into it from the river. Water from the washing plant is returned to lessen the amount of pumping required. By stopping the river pump a short time the water level of the pond may be brought to where the cutter can reach the deposit in a worked over area.

Washing Plant

In designing the washing plant the main object was to eliminate kaolin, which comes to the plant in fairly large lumps. A ⅜-in. screen placed over the settling tanks was found efficient in removing them, so the settling boxes were designed to be covered with such a screen set on an angle of about 1-in. to the foot. The lumps of kaolin roll down the screen and fall



Plan, side elevation and rear elevation of dredge

into the overflow from the settling boxes under the screen. The overflow runs to a waste pit from which the water flows back

Hoppers in which sand is collected—Atlanta Sand and Supply Co.

by gravity to the dredge pond.

The settling boxes are simple hoppers designed to settle all but the finest sand and the clay.

To secure the proper arrangement of screen and overflow the discharge of the pipe had to be carried over the screens and the settling boxes. This was done by putting in an open trough with a splitter at the end to divide the discharge and send it into two cross troughs with openings for feeding it evenly across the screens.

New Power Plant

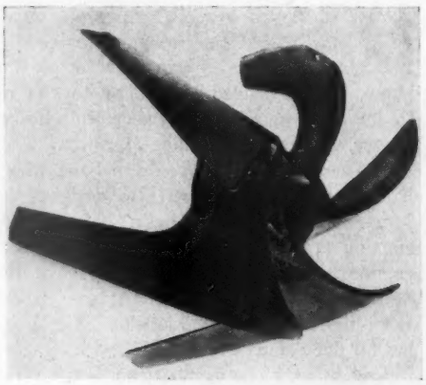
A new power plant was installed with return flue Schofield boilers and a 20x22 Skinner automatic engine. This drives a 280 kw. General Electric generator which delivers a 550-v. current to the line. As the distances to be covered by transmissions are not long, this was chosen instead of a high voltage generator and transformers. The power is used for a pump at the river as well as for the dredge pump.

Beside this dredging operation the company still conducts a hydraulicking operation on ground a short distance away.

The office of the company is in Atlanta. A. P. Burke, who is well known in the industry from his long service on various committees of the National Sand and Gravel Association, is the manager.

Bauxite Deposits of British Guiana

THE bauxite deposits of British Guiana may be divided into three classes, says Lloyd T. Emory in a recent article in *Mining and Metallurgy*. Of these classes only the lenses of massive bauxite in the sand-clay belt exposed between Christanburg and Akyma on the Demerara river are of any economic importance, he continues. The deposits are in the form of lenses or irregular masses. They vary from a few feet to 30 ft. in thickness. However, most of the deposits are very uniform as to thickness, which is in the localities observed, about 16 ft.



Special type of cutter head for working in hard clay—Atlanta

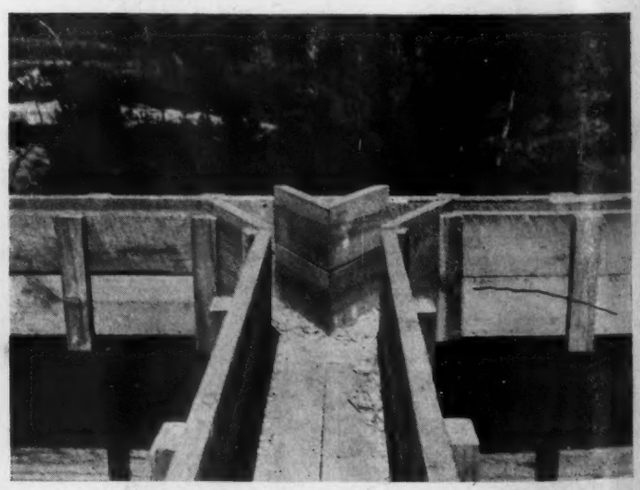
The lenses occur between the clay beds and the overlying sands. The tops of the deposits, where exposed by erosion or stripping, are fairly level. A foot or two of pebbly bauxite usually covers the massive form. The lower, or under side, of the ore is often soft, but the line of demarkation between the bauxite and underlying kaolin is rather well marked and nearly level.

The exposures which were first noted were the outcrops which stand up like bluffs at numerous points along the Demerara river. They are reddish brown in color with rough and pitted surfaces. When the oxidized surface is cut away,the ore is pink or light salmon in color and of much the same texture as pumice. It is exceedingly tough to break with a hammer, but can be whittled with a knife without dulling the edge. The pisolitic structure so common in American bauxite is totally absent in these beds, it was noted in some of the laterites and aluminous clays.

The surprising thing regarding these deposits is their chemical uniformity. Analyses which run high in silica usually have considerable kaolin mixed with the sample, so may not be considered as typical. Secondary deposits occur which have been formed by the breaking off of the edges of the main bodies or from material transported by erosion. While some of these are of considerable extent, their economic value is lessened by the intermixed kaolin, and the ore usually requires washing before being available.

The normal or commercial deposits occur within the sand-clay belt, but near to the upper or southwestern boundary. Outcroppings on the Berbice river and its tributaries, the Ituni and Mambakka, are similar to those on the Demerara but not so numerous. While outcrops of high grade bauxite have not been found on the Essequibo and Courantyne, these are large streams with broad, deep valleys, and it is quite possible that a careful search by drilling or other means may disclose that they are masked by detrital material.

The old method of sluicing into cars, by which part of the deposit is still worked—Atlanta



Flume and "splitter" by which pump discharge is carried over and divided between two screens—Atlanta

Sand Settling and Devices for Settling and Classifying Sand

Part I.—Principles of Settling and Classifying

By Edmund Shaw
Editor, Rock Products

IN 1921, the present writer, who was then with a company that designs and builds classifiers and settlers, published a series of articles, "Sand Settling and Sand Settling Devices," in ROCK PRODUCTS. These gave something of the theory of settling as it was generally understood at the time and described many of the machines and devices used in settling and classifying. The examples were not confined to those used in the rock products industries. They included many from mining and the chemical industry, for settling and classifying are used in many industrial processes and the solution of a problem in one industry may often be applied to the same problem in another. This practice will be followed in the present series.

The issues of ROCK PRODUCTS containing the articles referred to have long been out of print, and as calls for them are occasionally received, even at this late date, much of what will be published in this series will include the same matters as the former articles. But both the theory of settling and the devices used have advanced greatly in the seven years that have elapsed, so additions, corrections and modifications will be made to bring the present articles to date.

Terms Used

Settling, when the word is used to define a technical process, means that the finely divided particles of a solid are allowed, or induced, to come to a state of rest. It is assumed that the particles before settling are moving with a stream of water or some other liquid. The word settling by itself is generally used to indicate that all the particles, fine and coarse, are allowed to fall together, so that there is a separation of all the solids from the liquid, excepting such liquid as remains in the voids of the settled mass.

Classification is a separation of fine from coarse particles by settling. The settling is so controlled that the coarse particles settle and the fine particles flow away with a stream of liquid. This stream may flow across a tank or vessel, carrying the fines away while the coarse settles out, in which case it is *surface current classification.* Or the stream may rise through the vessel with a velocity which does not permit the fines to settle, and so carries them away from the coarse, in which case it is *rising current classification.* Another name for rising current classification, especially where it is applied to fine particles, is *elutriation.* All forms of apparatus used in settling and classification, no matter how complex they may appear, use either simple settling, surface current classification or rising current classification or a combination of them.

The *falling rate* is the rate at which a grain of definite size, shape and weight falls, or settles, through water or other liquid. The rate of fall is so nearly constant that it may be taken as a constant for practical purposes, that is, the design and construction f settlers and classifiers.

Hydraulic separation is sometimes used instead of classification, and it would appear to be a better term. But classification is so firmly fixed in technical literature that a change can hardly be made now.

Sizing is used for classification in some of the older books. *Sorting* was used in the same way and its use lingers in such expressions as "sorting column," the part of a classifier in which fine and coarse grains are separated.

Theory of Settling and Classification

P. R. von Rittinger, an Austrian, was the first modern investigator of settling. His books were published in 1870. Prof. Robert H. Richards of the Massachusetts Institute of Technology was the foremost investigator of recent times, and he covered the subject very thoroughly in "Ore Dressing," published in 1906, and "Principles of Ore Dressing," published somewhat later. Since Richards' work nothing of much *practical* importance has come to the writer's notice, although the theory of settling, especially as applied to the settling of very fine particles, is probably being studied more intensely now than it ever has been. Some very ingenious devices have been introduced lately for determining the fineness of grains of cement and similar materials, using the falling rate as a method of determining the grain size.

The reader who is interested may find a good, condensed discussion of the theory of settling in Taggert's "Handbook of Ore Dressing," published in 1927. Only the most essential parts of the theory, those that are needed to design settling boxes and classifiers, will be discussed in this article.

Determination of Falling Rates

Falling rates of grains may be determined experimentally in a simple way. A glass tube, at least 4 ft. long, is needed and two rubber stoppers to fit the ends. The tube is filled with water and a few grains of the size to be tested are put in. If a 1-in. tube is used, 10 or 12 grains are enough. The tube is then corked so that there are no air bubbles, and two rubber bands are placed on the tube exactly 2 ft. or 3 ft. apart, according to the length of the tube. There must be some space between the bands and the ends of the tubes.

The tube is inverted and the observer calls "now" when the grains pass the first rubber band and again when they pass the second rubber band. An assistant with a stop watch notes the time elapsing and from the number of seconds taken to pass through the 2 ft. or 3 ft. distance the falling rate is calculated.

By making several tests on each size of grain separated by such a series of sieves as the Tyler standard testing sieves a series of falling rates may be obtained which can be plotted as a curve. Such a set of falling rates and the accompanying curve are shown in Table I and Fig. 1.

TABLE I.—FALLING RATES OF AVERAGE SIZED GRAINS BETWEEN TYLER STANDARD SCREENS

Between screens	Average dia. of grain in mm.	Falling rate in mm. per second	Falling rate in in. per second
6 and 8	2.884	199.0	7.70
8 and 10	2.006	167.0	6.50
10 and 14	1.410	126.0	5.00
14 and 20	1.000	95.0	3.80
20 and 28	0.711	72.0	2.90
28 and 35	0.503	54.0	2.15
35 and 48	0.356	40.2	1.58
48 and 65	0.252	30.3	1.20
65 and 80	0.192	24.2	0.96
80 and 100	0.161	19.2	0.77
100 and 120	0.136	13.7	0.54
120 and 150	0.114	9.7	0.38
150 and 170	0.096	6.8	0.27
170 and 200	0.081	4.8	0.19

The figures in this table have been largely taken from Taggert and the velocity in mm. has been calculated to inches to make the table more useful in figuring settling and classifying areas.

Mathematics of Settling

The curve shown in Fig. 1 is in reality three curves joined at the end, the joints indicated by the breaks. For it has been found

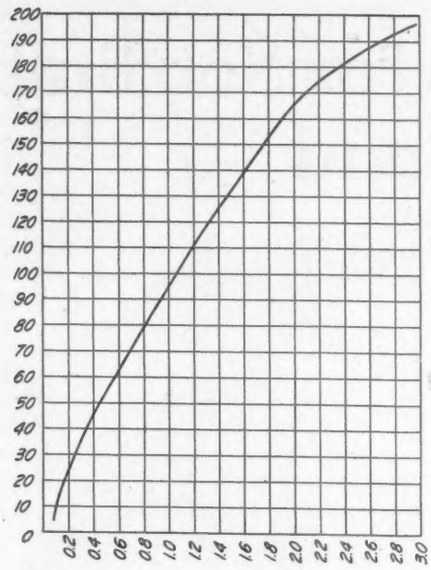


Fig. 1. Curve plotted from table of falling rates. Note bend at 2-m.m. rate

that grains differing widely in size do not fall according to the same law. The finer grains, from 0.16 mm. to 1.6 mm. fall according to the law:

$$V = 450\ D^2\ (\delta - 1)$$

The medium grains, from 1.6 mm. dia. to 2.5 mm., fall according to the law

$$V = 95\ D^{0.83}$$

and the coarsest grains fall according to the law:

$$V = 92\ \sqrt{D\ (\delta - 1)}$$

In all these, V = the velocity, or falling rates, D = the diameter of the grain and δ = the specific gravity of the mineral.

The whole subject of falling rates of fine particles in air and water has been thoroughly investigated of late. Earlier investigators spent a lot of time trying to find a single law to cover grains of all sizes, which was time wasted, as the division of falling rates into groups was not understood.

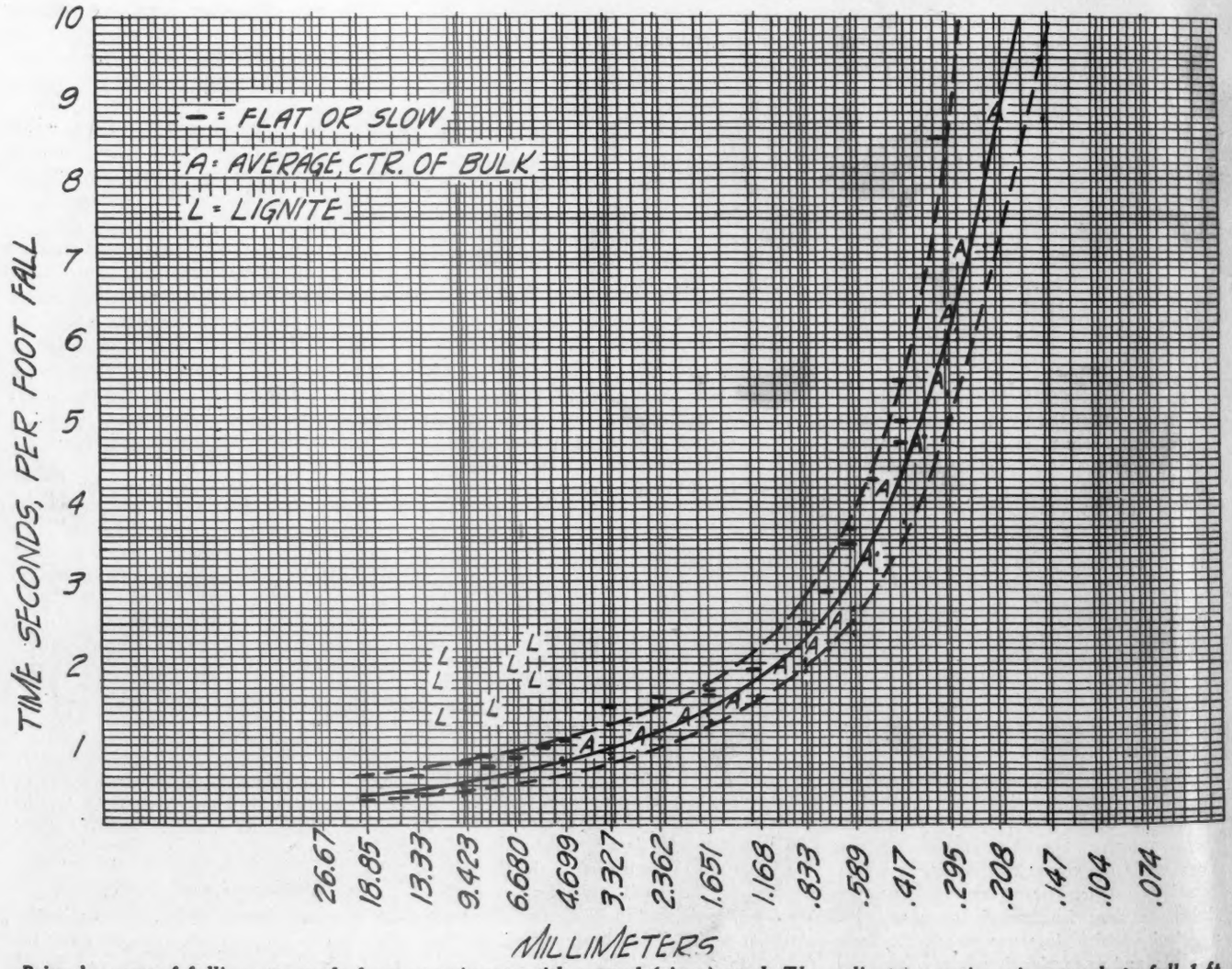
Why grains of one diameter should fall according to one law and those of a different diameter according to another law is not yet understood. The most reasonable explanation offered is that the change in rate is somehow connected with surface tension phemonena. Those who are interested in the subject will find more about it in the books by Taggert and Richards which have been mentioned than can be given here.

John Prince, president of the Stewart Sand Co., Kansas City, Mo., has done a great deal of work on classification, and, with the present writer, has devised some forms of classifiers and settlers. Prince has experimentally determined the falling rates for natural sand (river sand), the only work on this material of which the writer knows. The figures obtained were orginally plotted as a curve, which is reproduced here, and from this the falling rates in inches were calculated and are given in Table II.

TABLE II.
COMPARISON OF FALLING RATES

Screen	Size of grain, mm.	Rate, sec. per ft. (Prince)	Rate, in. per sec. (Prince)	Rate from formula in mm.	Rate from formula in. per sec.
⅜-in.	9.42	0.56	23.5	362	14.5
3 mesh	6.68	0.62	19.4	305	12.2
4 mesh	4.69	0.75	16.0	256	10.2
6 mesh	3.33	0.95	12.6	216	8.6
8 mesh	2.36	1.20	10.0	182	7.4
10 mesh	1.65	1.40	8.6	152	6.1
14 mesh	1.17	1.80	6.7	108	4.3
20 mesh	0.83	2.50	4.8	82	3.1
28 mesh	0.59	3.10	3.9	61	2.4
35 mesh	0.42	4.30	2.8	46	1.8
48 mesh	0.29	5.60	2.1	35	1.4
65 mesh	0.21	8.80	1.3	26	1.1
100 mesh	0.10	.....	.....	8	0.2
200 mesh	0.07	.....	.....	4	0.1

The curve does not follow the usual form, as the *times* of fall instead of the rates in inches per second are used as ordinates. The



Prince's curve of falling rate made from experiments with natural (river) sand. The ordinates are times in seconds to fall 1 ft.

plotting is on logarithmic paper, which allows the curve to be plotted for all sizes from the coarsest to the finest.

In this table the grain size is the exact size of the screen opening and not the size of the average grain retained between two screens.

It will be noted, from a comparison of the rates of fall in inches per second given in the fourth and sixth columns of Table II, that Mr. Prince found that grains of natural sand fall much faster than the rate for grains of crushed quartz, on which the calculation method was based. The difference is two mesh sizes in the coarser grains and one mesh for the finer. Thus Prince's rate for 10-mesh grains is 8.6 in. per sec., which is the calculated rate for 6-mesh grains. And in the finer sizes, Prince's rate for 65-mesh grains is 1.3 in. per sec., which is very near the calculated rate, 1.4 min. per sec., for 48-mesh grains.

This is not surprising when it is remembered that both are *average* rates of fall. Prince's rates were obtained by plotting the rate of the slowest grains as the rate of the finer screen and for the fastest grains as the rate for the coarser screen. Thus for grains between 48-mesh and 65-mesh the lower falling grains were plotted on the 65-mesh line and the faster grains on the 48-mesh line. In this way two curves (shown by the dotted lines) were plotted and the curve of averages was plotted from these (shown by the heavy line). The results merely indicate that there is a much less quantity of slow falling grains in river sand than in crushed quartz.

The formula by which the calculated rates were obtained is based on the mean of a number of experiments made by Richards and the maxima and minima are stated to have varied from 15% to 50%.

Slow and Fast Grains

In his earlier work Richards found it advisible to separate the grains into two groups, fast and slow, and give separate falling rates for each group. As an example which will show the great difference between the rates of grains of between two screens of a series the following, the figures taken from "Ore Dressing," Vol. I, are given:

TABLE III.—FAST AND SLOW GRAINS

Mesh size	Fast grains velocity in mm.	Slow grains velocity in mm.
10- 12	221.1	126.8
12- 14	185.8	109.5
14- 16	167.1	100.8
16- 18	156.7	97.7
18- 20	142.2	86.3
20- 24	133.3	71.7
24- 30	116.7	56.4
30- 40	89.5	40.0
40- 50	73.1	32.0
50- 60	61.3	26.1
60- 80	51.8	16.8
80-100	35.0	9.0

Reason for Fast and Slow Grains

The reasons for such a great difference in the falling rate of grains are: That grains assumed to be the same size (weight) are not the same size, that grains assumed to be the same in shape are not the same, and that some grains are more compact than others, that is, some grains are solid while others may contain minute cracks and fissures. All these affect the falling rate.

Probably the most important reason is to be found in the assumption that all grains remaining between two screens of a series are of the same size. In the Tyler standard sieves the width of the opening in a screen to the width of the opening in the screen next larger is as 1:1.414. The diameter of the largest grain retained between these screens will hence be about 1.4 greater than the diameter of the smallest grain. But it is the *cube* of the diameter that determines the weight and the cubes of 1 and 1.4 are 1 and 2.8. Hence if all other conditions were the same, the largest grains would fall about 2.8 times as fast as the smallest, their fall being governed by the same law. This is the important reason for differences in falling rate; the other reasons will be discussed in detail a little later.

The fact that grains of so many sizes and shapes are included in the grains left between two screens of a series is what makes it impossible to test the work of a classifier by a screen in any but the roughest way. A good laboratory classifier will take such a mass of grains and make several separations from it. However, all specifications of sized products are based on the results of testing with sieves, and as these specifications must be met the classifier and settler must be made to conform to the screen separation as nearly as possible.

Conditions Affecting the Rate of Fall

In what follows it is assumed that grains have the same dimensions, except grains of different shapes. For grains of the same dimensions, things which affect the falling rate are:

1. *Specific Gravity.* The specific gravity of the mineral of which the grain is composed may be anything from that of lignite (1.20) to that of galena (7.59) or even metallic copper (8.48), taking into account only those minerals to which settling and classification are applied in everyday work.

In the rock products field almost all the substances treated have about the same specific gravity (2.60 to 2.70), which is about the specific gravity of the mineral quartz. This is fortunate for the investigator, as tables of falling rates secured by experimenting with crushed quartz may be used in a practical way.

The specific gravities of some common rocks as given by Pirsson in "Rocks and Rock Minerals" are:

Silica (quartz)	2.65	
Feldspar	2.57	2.67
Talc	2.70	2.80
Limestone	2.60	2.80
Granite	2.68	2.75
Traps		
Diorite	2.80	3.10
Basalt	2.90	3.10
Diabase	3.00	3.30

The trap rocks are so much heavier than the others that a slight allowance can be made in designing classifiers and settlers to handle them; that is, settling boxes and classifiers can be made somewhat smaller for the same work.

Advantage may be taken of the difference in falling rate to separate two minerals. This is regularly done in treating metallic ores. In the rock products field the writer and others have used it to separate lignite and coal from sand. In the coal industry it is extensively used to separate shale and other rock from coal.

Shape of the Grain. The shape of the grain affects the falling rate in that thin, flat grains fall more slowly than rounded grains. The thin grains have more surface in proportion to the volume and it is the surface exposed that controls the rate of fall, as the resistance is proportional to the wetted surface.

Very thin grains like those of mica have so slow a settling rate that they may be largely removed from sand by hydraulic separation, something that is of value in preparing sand for concrete fine aggregate.

Porosity. Porosity has the effect of making the grain lighter for its size, and hence more apt to float. Phosphate rock is about the only rock products mineral which is always porous, although some limestones are porous enough to affect the settling rate. Porosity may be taken advantage of to make separations, although the writer does not know of its having been done on a commercial scale. Experimentally he has secured a fairly good separation of phosphate rock from quartz sand in this way.

Magnetism. Grains of magnetic iron ore will sometimes cling together in masses and fall at a much faster rate than a single grain would fall.

Temperature, Viscosity and Other Factors. So far we have spoken only of qualities of the grain that affect the settling rate. But there are certain conditions of the liquid in which the particle sinks that affect the rate of fall. One which will be most commonly met with is that of temperature. Grains fall faster in warm water than cold, the effect being much more noticeable with the fine grains than with the coarser grains. Viscosity is a factor when other liquids than water are used, as they are in some laboratory elutriators for testing cement and, on a large scale, in some chemical industries.

The specific gravity of the liquid must sometimes be taken into account. Sea water weighs more than fresh water (64 lb. instead of 62.5 lb. per cubic foot) and fine particles do not settle in it so well as in fresh water.

In the laboratory liquids of great specific gravity are used to make separations by utilizing the difference in falling rate. A solution of lead acetate may be used to separate shale from sand, the shale floating while the sand sinks.

Free and Hindered Settling

Free settling conditions are those in which

every grain is free to fall without being affected by other grains, either falling or held in suspension. All the falling rates given here are the free settling rates.

Hindered Settling Conditions

Hindered settling conditions are those in which a crowded mass of grains are kept in suspension in a rising current of water. The grains can move a little but they jostle each other as they move. Under hindered settling conditions the grains will stratify themselves, the coarsest grains at the bottom and the finest at the top. This stratification is *hindered settling classification* and it has been taken advantage of in a commercial way to remove light minerals (which work up to the top with the finer grains) from heavy minerals. It is the principle on which the jig works and the jig is being used on a large scale for removing lignite and trash from gravel.

Real free settling or hindered settling conditions are seldom found in settlers or classifiers doing commercial work. What is found is a condition between the two, the grains being affected in their fall by other grains which are either falling or held in suspension. The effect of this crowding of the grains does not seem to have been very well studied except for actual hindered settling conditions.

In practice, a method that works out fairly well is to consider that the grains and the liquid together make a liquid of greater specific gravity, and to find the settling rate of the grain in this new liquid.

For example: Let us suppose we have to deal with a mixture of water and grains carrying 26.75% solids, which will have a specific gravity of 1.20 and that we want to know the effect on the settling rate of a particle between 4-mesh and 6-mesh, having a diameter of 4.013 mm.

As this has a diameter greater than 1.6 mm. it falls according to the law:

$$V = 92 \sqrt{D (\delta - 1)}$$

Substituting we have

$$V = \sqrt{4.013 (2.65 - 1)}$$

$$= 92 \times \sqrt{6.62} = 236 + \text{or } 237$$

the rate of fall in mm.

Using 1.20, the specific gravity of the pulp with 26.75% solids in grains in the place of 1, we have:

$$V\ 92 \sqrt{4.013 (2.65 - 1.20)}$$

And solving this we have 213 as the rate of fall in mm.

This figure 213 is 89.5% of 237, the falling rate in clear water. Hence if we were to build a box to settle only grains of this size and overflow all finer grains we would have to build it 100% — 89.5% or 10.5% greater than would be calculated from the free settling rate.

The general statement may be made that the rate of fall varies as $\delta - 1 : \delta - a$, where a is the specific gravity of the pulp.

(To be Continued)

Asphalt Sands and Fillers

THE following discussion of asphalt sands and fillers is from "Factors Affecting the Stability of Asphalt Paving Mixtures," a paper presented at the annual Asphalt Conference, held at Atlanta, November 28 to December 3, 1927. The remainder of the paper is a discussion of varieties of bituminous binders:

Factors Influencing Stability

Sands vary in their grading, the size and shape of the particles and to a smaller extent perhaps in the chemical composition of the particles. The two most important factors influencing the stability of the sand per se are mesh composition and shape of grains. The mesh composition which will produce the maximum stability for a given sand has never been accurately determined. It would involve a great deal of experimental work and the figures so obtained would probably not hold for other sands. It is generally recognized, however, that a certain proportion of 10-, 20- and 30-mesh grains are desirable, as they lower the voids and being less mobile than the smaller grains add to the stability. A certain proportion of 80- and 100-mesh grains are also desirable, as they reduce the size of the voids to be filled by the filler. For reasons explained under "fillers" it is undesirable to have these voids too large. With these two requisites fulfilled the relative amount of 40- and 50-mesh grains is not very important. These grains act as primary fillers for the largest size voids.

Grains which have been rounded and worn smooth by water action tend to make an unstable mixture as they move readily upon each other and asphalt does not adhere to them as well as to grains with rough, pitted surfaces. Certain sands appear to adsorb asphalt to a certain extent while others, notably those composed largely of flint grains, will retain only a very thin coating of asphalt. This perhaps is more important in connection with the water resistant qualities of the mixture.

From the standpoint of our present knowledge, mesh composition, shape and character of grain surface are factors which can be utilized to increase stability. Where only a single sand supply is available, the only possible variants are the other two ingredients of the mixture. Sands exhibit marked differences when made into mixtures which opens up interesting field for investigation. Two sands having the same mesh composition and voids may vary greatly in their capacity to hold asphalt either by themselves or after the addition of filler.

It is also interesting to speculate whether sand grains which will only carry a very thin coating of asphalt are perhaps desirable from the standpoint of stability due to the high surface tension of the thin film of cementing medium as compared with the lower surface tension of a thicker film.

In the case of the filler, we may vary its composition, fineness and amount. Its function is to reduce the voids in the mineral aggregate both as to size and amount, thus increasing the contact area and inherent stability of the aggregate itself. Its stabilizing effect on the dry mineral aggregate can be readily demonstrated by mixing the dry filler and mineral aggregate and introducing the mixture into an ordinary measuring cylinder. After a little tapping the cylinder may be held in an inverted position without any of the dry mixture running out. This would be impossible before the addition of the filler.

Fillers

The voids in the mineral aggregate vary considerably in size. It is undesirable to fill large sized voids wholly with fine material, as this has a tendency to produce a bally mixture. A certain percentage of relatively coarse particles should therefore be present in the filler, the amount theoretically being dependent upon the mesh composition of the mineral aggregate. The most commonly used filler is limestone dust. Next in importance is portland cement. Ground silica, slate dust, soapstone dust, clay and hydrated lime have also been used. With the possible exception of the last named, none of these fillers have any chemical action on the asphalt cement.

Methods for determining their fineness with any degree of exactitude have not been in common use. Most specifications call for a minimum percentage passing the 200-mesh sieve. Based on this method of classification, there have been many unexplainable differences in the action of fillers of the same type and degree of fineness. Two samples of limestone dust from different manufacturers having the same amount passing the 200-mesh would produce mixtures varying from very sloppy to stiff when used in mixtures in which the only variant was the make of filler.

Action of Fillers

Many service tests have indicated that portland cement would usually produce a stiffer raking mixture than would limestone dust, although stability tests on the compressed mixture have failed to show any difference. Immersion tests on mixtures identical except that one contained silica dust as a filler and the other limestone dust have shown a much greater resistance to water action on the part of the limestone mixture. The particles of certain fillers are strongly absorbent toward asphalt and many clays are strongly adsorbent as well. On the other hand certain clay asphalt mixtures when immersed in water swell badly and quickly disintegrate, while those made from other clays do not. Apart from the physical functions of reducing voids there is much in connection with fillers and their action on paving mixtures that we do not yet understand. As stabilizing factors their value is largely dependent upon fine grinding, although this may be carried to excess.

Price-Cutting Which a Buyer Curbed*

A Leaf from the Book of Trade Emphasizes the Consumer's Interest in a Stabilized Market—Selling Methods That Bring Demoralization

By Saunders Norvell
President, Remington Arms Co., Inc., New York City

BY CAREFUL, honest, straight thinking and the elimination of details and side issues, almost every business situation can be boiled down to its essential facts. Then the problem, which at first appeared complicated, is usually found to be a simple one.

As we all know, on account of the fierce competition that now exists in this country, the reduction in profits and the continued high cost of doing business, many concerns are not especially enjoying this era of profitless prosperity. These conditions lead to situations, particularly between competitors, that call for very straight thinking. It may be interesting for me to tell some of the cases that have come under my observation. They are actual business situations that I know have existed and are existing.

One Cut Leads to Another

In a certain industry that sells raw material almost entirely to manufacturers, one large producer, by a secret cut in price, took a very valuable account away from one of his competitors. Of course, when this manufacturer stopped buying from his original source of supply, they realized what had happened. As this concern was not any too strong financially, in order to keep their business going, they very naturally offered a cut price to another manufacturer, this cut price being less than the cost of production. They secured a large order. This order would at least keep them going for a year, even if they did not make any profit. With this producer it was not a question of making profits—it had become a question of existence; a question of not shutting down the factory and going into the hands of a receiver. A third producer in the same line of business, learning of these cuts, issued a circular in a spirit of retaliation in which he cut the price to the entire trade of the country—big and little.

Now we have the situation where this entire industry is on a price basis of less than the actual cost of producing the goods. In this situation, these several producers, in turn, with their cut prices each went after the business of a manufacturer who uses a large quantity of their goods. One would suppose that this manufacturer would have been delighted at the opportunity to buy his goods at a lower price. Here was an opportunity for him to obtain a raw material at a figure that would lead to a reduction in his manufacturing costs and, hence, if he maintained his own prices, to his making a larger and more satisfactory profit.

It Was the Buyer Who Saw the Light

However, imagine the surprise of these three producers when this manufacturer told them flat-footed that he did not wish a lower price. He told them, in fact, that, with conditions as they existed just at present, all of them were using exceedingly bad judgment to cut prices. This manufacturer said to them: "If you cut prices on your raw material, logically it will only be a question of time until this price-cutting will travel to the manufactured product. Just now, we are making only a small profit on the manufactured goods and we cannot stand a cut in price. As manufacturers, what we desire more than anything else is a stabilization of the market. If you cut your prices and if we cut our prices, this cutting of prices will automatically lead to a curtailment of business because everyone knows that the general trade never buy freely on a declining market.

"Now, gentlemen," said this manufacturer, who evidently had his nerve with him, "stop and think this thing over. Do not quote us any cut prices. Go home and withdraw the cut prices you have already made. Do your level best to fix up the situation. We ourselves will not be parties to any plan to demoralize our line of goods, and the first step is to stop the people from whom we buy our raw material from starting the demoralization."

HERE is an argument for maintenance of fair prices that can be read profitably by every producer in the rock products industry. It is directed specifically to producers of BASIC RAW MATERIALS, and applies just as aptly to cement, lime, crushed stone, sand or gravel, as it does to steel, which it is presumed the writer had in mind.

The article is particularly valuable because it is written by a representative BUYER. And while Mr. Norvell's interests may be so extensive that his views are broader than those of the average buyer of basic raw materials, they are sound enough to be accepted by all who will study and digest them.—The Editor.

How the Buyer Reasoned

Naturally, the position taken by this manufacturer, judged by common standards, was a rather original one. In discussing the subject with him, I asked him to go a little deeper into his view of the situation. "Well," said this manufacturer to me, "we are one of the largest users of this product in this country. Naturally, we have always enjoyed an inside price on account of the quantity of the goods we buy. We have never used this inside price in our sales price. We have set it aside as an extra profit and it has helped us in developing our business and in giving better service to the trade.

"But don't you see, if all these producers in this line sell their goods at cost or at less than cost, they are not in a position to do anything, either for themselves or anybody else? When a market is demoralized and goods strike cost, the price is usually the same to everybody and even large and intelligent buyers can not obtain any special inside prices. Therefore it does not take much intelligence to see that it is not to the interests of a large buyer to see the market on any of the goods he uses go into a demoralized condition. Unfortunately," said my friend, "there are a number of buyers who buy for large institutions who have not thought deeply enough into the subject to see the truth of this principle."

Under present conditions, I think there are a good many jobbers and manufacturers who should think over the above conclusion of my far-sighted friend, who is one of the most successful manufacturers in the United States—a man who, in good times and bad, has always managed his business so as to come out with a profit. It is curious, however, to see a large buyer who under present conditions was not waiting to accept a cut price, but who on the contrary recommended to the sellers that they come to their senses and stabilize the market on their goods.

Receivership Competition Not Welcomed

Here is another interesting case that has recently come under my observation: In a certain industry, there is a very powerful seller who, by reason of almost unlimited capital and a great variety of products, has, by cutting the prices in one department of his field, practically eliminated all of his

*From *Iron Age*, November 24, 1927.

competitors. There are only three or four manufacturers left in this field in the United States. None of these manufacturers is making any money. This powerful manufacturer announced on a certain date that he proposed again to cut the price. One of his weaker competitors, who carries a large burden on his business in the form of bonds, went to this powerful rival and said: "Now, let us lay our cards on the table. Let us talk straight. You now sell a very large proportion of the goods in this line. You are selling these goods without any profit because you make profits on other goods that you manufacture in other lines. Just what is your object? Do you expect to kill off all of your competitors in this line and be the sole manufacturer of this line in the United States?"

"No," replied the powerful manufacturer. "Naturally, that situation would not appeal to me. Naturally I must have a certain amount of competition." "All right!" said this weaker manufacturer. "Which would you rather compete with—a concern like ours in our present condition *or a concern like ours in the hands of a receiver?* There is no question whatever that if this competition continues as it has been, we are going into the hands of a receiver. If we do go into the hands of a receiver, I will probably be the receiver myself. Naturally, as a receiver for the business, I will be relieved of the obligation of paying interest on bonds and I can also escape from many other obligations under which we now labor. In other words, don't you see that as a receiver I could be a much harder competitor for you than I am at present?"

Now, the curious point in this situation is that this powerful manufacturer never seemed to have thought of this. He was so busy with his other affairs that he had not thought exactly what would happen in the future if he continued selling this line on a destructive basis.

Selling Policies Call for Hard Thinking Higher Up

"But," said I to my friend who was telling me these interesting things about American business today and who also told me that these cases were not uncommon; that, no doubt, there were many of them in the trade in all of the various lines, "isn't it the object of these manufacturers today who are taking advantage of their strong financial position, to freeze out weaker competitors, to get the entire market in their hands and to be afterward in a position to advance prices?"

To this inquiry he made the most surprising answer. "No," said he, "I do not think that is true. What I do think is true in many industries is that the leading men—the men who have the capital invested—the real owners of the enterprise, when their businesses are in a prosperous condition have practically turned over the selling end to sales managers who are interested chiefly in making sales records. I am of the opinion that many of these sales managers in the United States today are doing things in the way of authorizing cut prices without thought of what it all means, and the heads of these businesses, in many cases, are not paying close attention to the business. They take the reports of the sales managers.

This merchant told me that in one industry he took occasion to call the attention of the head men in the business to some of the things their sales managers were doing. This led to an investigation of conditions upon the part of the heads of several large enterprises. These proprietors, who are older, who are mellower and who are not stirred up by the selling battle and all of the animosities and jealousies that arise in the selling of goods, got together quietly and talked over what their sales managers were doing.

The result of this meeting was that the sales managers received the surprise of their lives in some of the instructions that came to them direct from headquarters. Human nature is always human nature. All of us are very apt to be more generous on an expense account with someone else's money than we are when we are traveling and paying the bills out of our own pocket. All of us, being human, are more inclined to cut prices when the loss of profits as a result of the cut comes out of the pocket of someone else! "In other words," said my friend, "in my opinion, in the present selling situation in the United States, it is right up to the proprietors of the business to make a very thorough investigation of what their own selling organization is doing."

The Preferential Buyer May Be a Source of Demoralization

These reflections have all led me to think of buying and price-cutting. Some buyers with a "22-short" mentality, when they secure a special concession, delight in telling all the salesmen who call upon them about the cut price. This puffs up their vanity. How foolish they are. I know of buyers who, when a salesman calls, will tell him that his prices are no good; that he had better write home and get lower figures so he will be in the game. What happens after a foolish talk of this kind? The salesman does write home. He does influence his house to give him lower prices. Then he calls on the competitor of our buyer and sells the competitor at these lower prices. In other words, by the loose wagging of his tongue our Smart Aleck buyer is simply helping his competitor buy his goods 5 to 10% cheaper!

How well I remember that it was the policy of the Simmons Hardware Co. under I. W. Morton, that great buyer of the house, always to protect the seller on his prices. How well I remember when this house was enjoying a special rebate from a factory and other salesmen called, attempted to get the business, that they were told, *not that their prices were too high;* only that the house at that time just happened not to be needing any of the goods or had made other arrangements. In other words, it is one of the first duties of a good buyer to soothe the visiting salesman with the idea that his prices are entirely right and that other reasons besides prices led to the placing of the business elsewhere.

How many buyers have ever thought this out? How well I remember, in one case where Mr. Morton was enjoying an especially satisfactory arrangement with a certain manufacturer, that, instead of buying all of his goods from that manufacturer, he bought the same goods in smaller quantities from other manufacturers as well, the object of this buying being to cover up the fact that a special price was being received.

Give Thought to the Welfare of the Industry

Summing up the reflections in this article, it would seem that we should have a broader vision on the part of those in charge of sales and on the part of those in charge of buying than exists at present in many cases. All of us, in times like these, should think very seriously about the general welfare of the industry in which we are engaged. Paradoxical as it may appear, the manufacturer who comes around to the buyer with a cut price is not always the best friend of this buyer. This manufacturer is often an enemy to the welfare of the industry. All of us should get the principle in our minds that it is not always the low price that we receive which is the most advantageous. Low prices frequently lead to the demoralization of an entire industry. In every phase of this industry, from raw materials through the manufacturer, to the jobber, to the retail merchant, progress only can be made on those lines of goods where manufacturers, jobbers and retailers are making a fair and reasonable profit. Progress can never be made when goods are sold at cost or at less than cost.

The salesman who calls on you with a cut price is giving that cut price to your competitor. Often—in fact, usually—your competitor will use this cut price to reduce his prices. A cut price to you is generally followed by lowered profits. Let me repeat: It may be a paradoxical situation, but in many cases wise buyers, when a salesman offers them cut prices today, should ask: "Why the cut price? Are you giving it to everybody? What will be the net result of this cut price—not to us—but to our industry?" I think some of our selling friends will have difficulty in answering this question.

Madagascar Mica Industry

THE production of Madagascar mica is developing more and more and threatens to rival the Canadian market. The export actually amounts to more than 300 tons of muscovite mica and phlogite, the latter being employed to a greater extent in the electrical industry. The average price of these micas varies from 1 to 20 francs per pound, according to the quality.

The Manufacture of Gypsum Plasters

Leaves from an Operating Man's Note Book—Part II

By W. B. Lenhart
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IN THE first part of this article, published in ROCK PRODUCTS, December 10, 1927, issue, I discussed some of the common causes of quality difficulties in a gypsum mill and gave some suggestions to overcome them. The general discussion carried the manufacturing procedure from the preparation of the raw rock to regrinding after calcination. In the concluding part below, I hope to bring out some of the points to be considered for successful kettle operation.

Loading the Kettle

Uniformity in the method and rate of loading a kettle is necessary for a uniform product. This point is frequently overlooked entirely for the reason that the design of loading equipment is such that uniformity is impossible. The main consideration is to have a steady and uniform flow of material going into the kettle which at all times can be controlled by the operator. This can be accomplished by means of a screw conveyor, either separately driven or driven from the kettle rabble mechanism. This conveyor, or better a pair of conveyors, should be so constructed that "flooding" would be impossible and the rate so regulated that once the loading is started it could be completed without interruption.

The rate of loading will depend upon the fineness of the material, temperature of the fire-box and the horse-power available to pull the load. The faster the loading the better, but at no time should the material be fed so fast as to cause the boiling action to cease, for fear of sticking the kettle. Once the above factors have been established the loading should be speeded up to the fastest practicable time.

To make it clear why this is desirable: It is possible to load a kettle so slowly that by the time the average water content is down to the desired percentage the kettle would not be completely loaded. In other words raw gypsum would continue to run into the supposedly calcined stucco. Quick loading under uniform conditions is thoroughly practical and should be the goal of the operator.

Calcining rock gypsum that has not been previously dried usually requires 2 to 2½ hours for the complete cycle. At this rate the loading should not take over 20 minutes. A cycle can be completed in less time than this but at the expense of the kettle shell. An excessive fire-box temperature soon burns out the shell and angle irons supporting wing walls, necessitating a costly and laborious replacement. It will be found more economical to have an extra kettle installed than to endanger the equipment by forcing the production too far.

Where the rock has been previously dried, and has the benefit of the residual heat, the loading and the total cooking time can no doubt be speeded up considerably.

The Loading Chute

The material from the loading conveyors usually passes through a chute of some sort. In many cases this chute is enclosed and attached direct to the kettle top. This no doubt makes a neat installation, but for the sake of quality this chute should never be directly connected to the kettle top, but should stop at a point sufficiently back from the top to allow the material, as it falls into the kettle, to be plainly visible at all times. There should be a good tight gate in this stub of a chute which can be quickly opened or closed. A tight plate cover over the loading door in the kettle should also be provided.

The point that is usually overlooked in the design of the loading chute is that there is always the possibility of the material in the bin overhead caving, thus causing a "run" past the flights in the conveyor. This might happen after the kettle is loaded and the material partly calcined.

With a direct-connected spout this condition could happen and be unknown to the operator, whereas if the spout is cut off as above suggested any cave in the bin overhead would run out on the top of the kettle and do no damage. This very thing has been known to happen a few minutes before the batch was done, and if the above precautions had not been taken 12 tons of defective material would have "mysteriously" resulted.

Rabble Arms

A word might be said regarding the rabble arms, which should so be designed as to sweep off the tops of the flues as clean as possible. Where the kettle is provided with four flues, two above two, three sets of arms should be provided; one set sweeping the bottom of the kettle, a second sweeping off the tops of the lower flues and the third sweeping off the top of the upper set of flues. This last set is usually omitted in most mills, but nevertheless they should be installed. Without this set of arms there will accumulate a bank of material on top of the flues, which on analysis will be found to be practically raw gypsum or at best only partly calcined. This may seem to the operator impossible, especially if the bank has not sloughed off for some time, and been subjected to successive cycles of calcining. However, the material will be found to be as stated, and should not be allowed to accumulate, as this bank might slough off as the kettle is being emptied, and non-uniform plaster would result.

The bottom set of rabble arms is usually provided with a set of chain drags to keep the bottom free. These chains wear out quite rapidly, and it is possible to correct this trouble by using a drag made up of cast iron, egg-shaped balls with a hole through their long axis. These balls can be strung on a suitable piece of ¼-in. cable. This drag will outlast a half a dozen chains, and to anyone who has had to change chains in a hot kettle this idea no doubt will appeal.

Fog Stacks

Another point of supreme importance is the design of the "fog" stack, which is the name usually given to the stack which conducts away the steam resulting from the calcination. The ordinary practice is to run this fog through a room or expansion chamber to allow some of the suspended plaster to settle. From this expansion chamber the steam and any stucco in suspension pass on out to the atmosphere.

The material that accumulates in this fog room is usually removed from time to time and re-calcined with succeeding batches.

The dust-collecting efficiency of this room or expansion chamber is very low, in fact it is practically nil and this chamber should not be allowed to exist. The small amount of dust that it does recover is expensive to reclaim, and in many cases it is possible for this accumulation to slough back into the kettle, which is highly undesirable. It is the writer's opinion that this stack should be a straight, vertical pipe of such height and diameter that the vapors at all times will be conducted away. When the loading door is open and loading is in progress there should be a decided draft inward and toward the opening provided for the outlet of the steam, etc. This draft will carry off some of the finer particles, but if the steam is not conducted away as fast as liberated short working plaster will result.

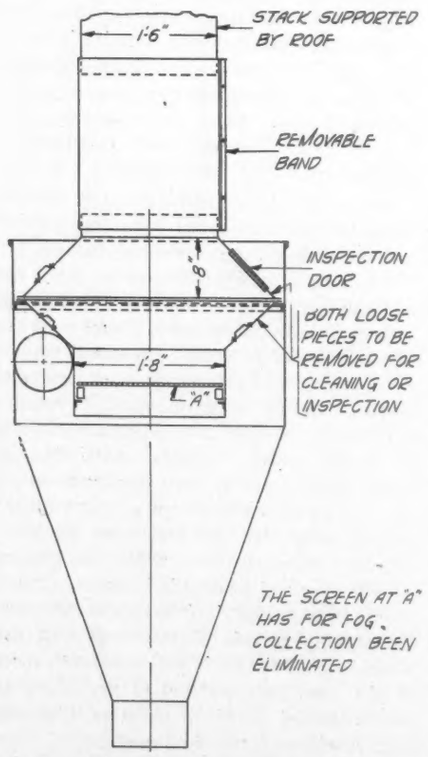
If any operator doubts this statement let

him cook off a batch of stucco allowing the steam to find its outlet in and around the loading door, or other small outlets, or in other words under slight pressure.

The fog stack and fog rooms are usually built with the idea of conducting away steam and dust from the kettle with no thought being given to the possible effect that this stack may have on the quality of the product manufactured.

In one plant in the West, which is located in a part of a city where dust could not be discharged to the atmosphere, this nuisance was overcome by installing what is known as the Senseman dust collector, which with a few alterations collected successfully better than 99% of the dust. This collector takes the fog from the stack by means of a fan which delivers the gases to a dust collector, specially designed for this purpose. Both the fan and the collector are provided with water sprays so located that the accumulation of mud or caked material is prevented. The water from this collector can be run to waste, or the material in suspension can be settled out, by means of a cone classifier or Dorr thickener, and the solids returned to the kettle with succeeding batches.

The mechanical difficulties encountered in collecting dust from the fog stack are aggravated by the fact that the so-called dust, or "fog," is not dust at all as popularly understood, but is damp or moist particles which if cooled off in the presence of the surrounding steam accumulates as a mud. Dust collectors designed for this work have to be kept at a temperature high enough to prevent this mud from forming. This is usually done by installing the collectors close enough to the kettles so that the heat losses have not been great, and at the same time protecting the equipment from the cold air, drafts, etc. This installation tends to take care of itself as the inside soon becomes coated with a layer of gypsum.



Details of the dust collector

Pipe was found unsatisfactory for conducting away the effluent waters from the Senseman collector. The waters from the collector are discharged at a temperature of around 150 deg. F., and are saturated with calcium sulphate at that temperature, and upon cooling some of the salts are deposited on the walls of the pipe in a hard cake, that was practically impossible to remove. This caking action is not due to actual setting of the plaster as these mud particles have already set, but is due to crystallization. The fact is that during their setting period they were in a state of constant agitation the interlocking of crystals was prevented.

The suspended material in the water settles and filters very readily and the cake resulting from the filtration does not set.

The mud-bearing waters are conducted away in open troughs and these have to be cleaned out about every 30 days. The cleanings are in the form of a hard crystalline deposit, much harder than ordinary set gypsum plaster, and resemble the structure of lime stalagmite.

These deposits have a banded structure probably due to the different solubilities of the dust at different points in the calcining cycle. Interesting researches could be conducted along this line of thought and possibly would yield information that would help to check this caking tendency.

No doubt by the use of a large volume of water, which would lower the temperature at the collector and cause the crystals to drop out while the material was in a violent state of agitation would help prevent this cake forming. This water then could be delivered to a Dorr thickener, which from preliminary tests indicates that a discharge ratio of 1 to 1 could be obtained.

The large volume of water would also be slower to cool on account of the larger mass.

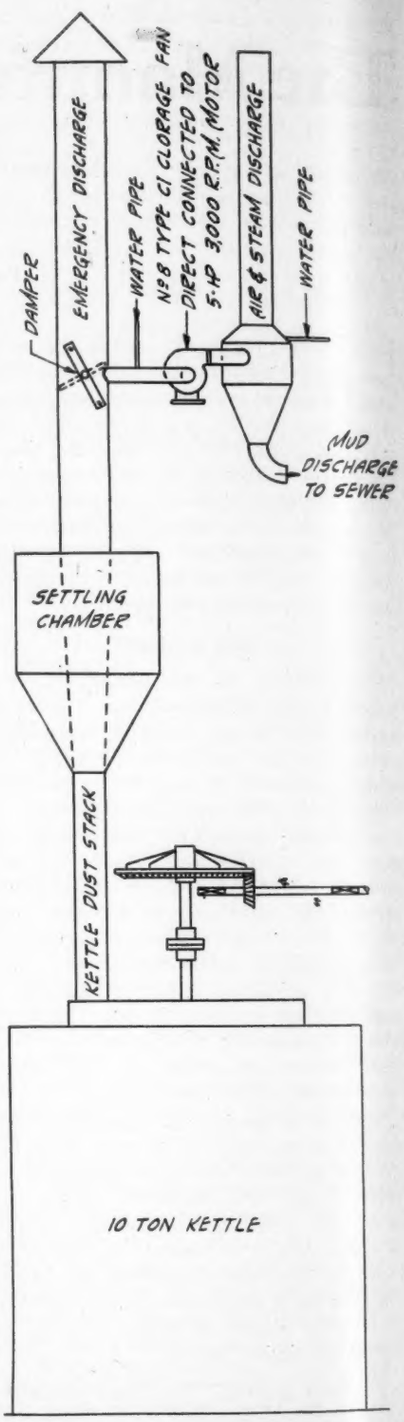
Samples taken at three different periods of the kettle cycle, one being while loading, the second about the middle of the cook, and the third toward the close, gave results showing considerable variation in the amount of dust being discharged at the different times. Calculations based on a series of these tests gave a dust loss of 1.7% figured on the raw basis. The amount of water required for 3.5 gal. per min. per kettle, although in actual operation 5 gal. per min. is used. The motor is direct-connected to a No. 8 Clarage fan operating at 3000 r.p.m. In one installation a No. 7 fan is used operating at 3600 r.p.m.

At one installation the waters are allowed to settle in a large tank and by means of a centrifugal pump of large diameter the slurry is pumped a considerable distance to an abandoned gravel pit.

As above stated, the sludge settles very rapidly and a Dorr thickener would give a discharge product of 1 to 1 ratio, which on the basis of figures already quoted would mean roughly 4000 lb. water to 4000 lb. of solids per 100 tons of raw material calcined. This amounts then to 2%.

There is no reason why this small amount of water and solids could not be added to the raw ground material before calcining, thus saving the dust as well as solving the disposal problem.

This amount of water should not affect



Dust collector attached to fog stack. The damper of the stack can be opened in emergency to discharge the dust to the atmosphere

the plaster, as it is common to have to grind rock which is wet from natural causes, and which has a much higher water content than the figures quoted.

The cost of this installation will run well under $1000 per kettle. This figure does not include the Dorr thickener installation.

The Senseman collector has very neatly and cheaply taken care of this dust problem on the Coast.

Recording Thermometers and Their Use

When rock gypsum is calcined the reaction is one comparable to simple evaporation. The calcium sulphate gradually loses some of its water until a product which corresponds to calcium sulphate with one-half molecule of water results. The usual procedure to follow in checking the accuracy of the thermometer is, on say the first kettle or batch calcined each 30 days to take samples from the kettle starting at a point when the temperature of the mass is 280 deg. F., and for every 10 deg. rise in temperature to take a sample from the kettle. These samples are put at once into a tightly stoppered bottle and the water content of each determined in the laboratory. The following were arrived at by such a procedure:

TEMP. DEG. F.	% WATER	SETTING TIME NEAT
280	7.2	14 min.
290	6.8	14 min.
300	6.4	18 min.
310	5.8	25 min.
320	5.7	25 min.
330	5.5	28 min.
340	4.8	30 min.
350	4.5	30 min.
375	3.5	30 min.
380 (15 min.)	2.0	25 min.
380 (45 min.)	0.3	20 min.

Dumping.

As the average sample of raw material before calcining showed 92% gypsum, or 19.2% water, the resulting calcined material should theoretically have 4.8% water. At this particular plant the temperature at which the batch was dumped was 340 deg. F. It is possible to lower this temperature 10 to 20 deg. without jeopardizing the quality. The only gain would be in fuel consumption which, at this point, owing to the rapid elimination of the water at this period of calcining cycle, would be small (about 0.2 gal. of oil per ton). As it is better to slightly over-cook then under-cook, this margin is simply one of safety.

In taking samples from the kettle for analytical purposes too much stress cannot be placed on the necessity of using tight-stoppered bottles, for freshly calcined stucco absorbs water very rapidly from the air, and in the case of the double-boiled material, where the stucco has about 0.5% water when discharged from the kettle, will pick up sufficient water to make an appreciable error in but a few minutes.

Few chemists realize the powerful affinity that freshly calcined, double-boiled stucco has for water; and no doubt there are many places where this inert, insoluble substance could be used to eliminate last traces of water. This would regenerate gypsum, which could be recalcined for the stucco. The writer has suggested that stucco be used to remove the last traces of water from oils. No doubt that research by the industry could extend the usefulness of gypsum for the above purpose.

The thermometers used in the kettle for indicating the temperature are the ordinary gas-filled recording instrument and should read from 50 deg. F. to 400 deg. F. The chart should be at least 10 in. in diameter for ease of reading. The hot point of the thermometer should be hung so as to be at a uniform depth in each cycle and far enough from the walls of the kettle to eliminate any possibility of error from that source.

The function of the thermometer is to *indicate* the amount of water in the calcining mass, and hence to check the accuracy of the thermometer is to check the water content as indicated by the thermometer. The fact that the instrument does not record the true temperature does not necessarily matter provided this variation is known and is recorded as read for the sample taken at that temperature.

Where there are two or more kettles the thermometers can all be immersed in the same kettle for checking purposes.

Artificial Ageing in the Kettle

It is a well established fact that the addition of a solution of certain salts to the kettle while calcining has the effect of artificially ageing the stucco. A solution of calcium chloride probably is the most suitable and is the basis of a patent for the artificial ageing of gypsum products.

When plaster absorbs a small amount of water after calcining a decided change takes place in the characteristics of the material. The most marked change being the decided reduction in the amount of water necessary to get to a given consistency. By reducing the amount of water the amount of voids is reduced and a stronger, harder and denser product results. Where the product is used for casting purposes this dense material is highly desirable.

No doubt the strength, hardness, denseness and the ability to take a polish of Keene's cement owe a lot to the fact that to get to a working consistency a very small amount of water is required for mixing compared to other gypsum products. The following will give an idea as to the amount of water required per 100 grams of stucco to get to a mixing consistency of the various gypsum stuccos:

Freshly calcined stucco (double boiled)	70 c.c.
Freshly calcined stucco 310 to 370 deg. material	70 to 80 c.c.
Aged stucco (double-boiled)	45 to 55 c.c.
Aged stucco (310 to 370 deg. F.) material	45 to 55 c.c.
Keene's cement	35 to 40 c.c.
Raw gypsum uncalcined for comparison only	35 to 40 c.c.

Just the opposite characteristics are wanted for ordinary hardwall plaster, as aged material will not carry the sand, and is not as plastic as fresh material; and as about 85% of the ordinary output of the mills is for hardwall purposes more thought should be given to this particular subject. The action of calcium chloride no doubt acts either as a catalytic agent or is a carrier of water to give an aged product. Further researches no doubt will bring us an agent that will "retard" the aging of plaster.

Gypsite plasters in the West do not find favor for plastering purposes, as they will not carry the sand, and no doubt this condition is due to the fact that these gypsite earths due to the mode of origin contain small amounts of deliquescent salts, which act in somewhat the same manner as calcium chloride.

Gypsite plasters are recognized though as making a harder and stronger wall, wallboard or tile than rock gypsum.

Discharging the Kettle

When the material in the kettle has reached the desired temperature the product is discharged by means of a gate near the bottom. The product runs through a short spout into what is called the "hot pit." This pit is usually made of reinforced concrete holding two batches. The purpose of this pit is merely as a surge storage between the kettle and the stucco bins.

In the more modern mills a series of screw conveyors takes the material out of the pit and discharges it into a master conveyor, which takes the material to the stucco bins. In the older mills the screw conveyor emptiers are unknown, their place being taken by manual labor; the laborers slowly hoeing the material out of the pit into the master conveyor. By this method, with a conscientious man, there is little danger of any old material being allowed to accumulate in the pit, but with the screw conveyor emptiers, unless care is exercised in the design of the pit, old material is liable to accumulate. In any case this old material should be removed and discarded and then in the future not allowed to accumulate.

Mechanically these emptiers have been very successful.

A common source of defective material is due to the carelessness of the operator in leaving the discharge gate open after emptying, and then attempting to refill the kettle, thus allowing raw material to mix with the stucco just dumped. This error is easily accomplished, as the gate is usually out of sight, and as the dumping operation requires about two minutes, something may attract the operator's attention momentarily; the net result is he forgets to close the gate. This possibility was removed at one plant by means of a device fastened to the gate which when open locked the loading mechanism, and until the discharge gate was closed no raw material could be fed into the kettle.

A description of these devices follows: In

this plant the loading was accomplished by two screw conveyors driven from the kettle counter shaft and were actuated by means of an individual jaw clutch and lever. The gate *A* (Fig. 1) when open or raised caused the rod *B* to go up, which in turn, by means of the toggle, caused the horizontal rod *D* to move as indicated by the arrow. This horizontal rod *D* was so placed that it passed in front of the lever used in shifting the sliding member of the jaw clutch.

Still another scheme, used successfully, was simply attaching a rope to the gate and passing it over two pulleys as indicated in Fig. 2. The rope being in turn fastened to a heavy fork so designed and so located that it passed between the stationary and sliding member of the jaw clutch, when the kettle discharge gate was open. When the kettle gate was closed this fork would be elevated out of the road so that the clutch could function properly.

Every kettle should be equipped with some safety device of this nature, for without it the chances of making defective plaster are good. If the operator makes this error once he will most likely tell the man in charge, but if he does it a second time he is liable not to, for obvious reasons, simply preferring to take a chance. More often than not this defective material gets by the laboratory, if there is one, and the result is the manufacturer has to scrape off some walls, replaster, foot the bill and take a lot of "dirty looks."

Plaster, like a lot of other things, is not made in heaven but here on earth by humans, and the more protection that can be given by mechanically making the operations foolproof the better it is for all concerned.

It should not be necessary to say anything about leaky kettle gates, but most mills seem to think that all that is necessary in the way of a gate is a piece of boiler plate hacked in shape by means of a cutting torch. Such expedients as stuffing a small bale of old sacks in the discharge throat then being looked upon as the solution for the leaking gate.

To be sure a small amount of leakage may be permissible, but the point is, who is to judge the amount of leakage? For when this condition is present, the dusty atmosphere at this point makes it practically impossible to see if only a few pounds or a few hundred are leaking. The kettle gate should not leak at all, and if it does it is simply a case of poor designing.

The latest practice places the hot pit far enough away from the kettle so that the discharging material, to reach the hot pit, passes through a short chute. Thus when the kettle is emptied and the gate closed this chute can be raised and any leakage from the gate will fall on the floor or in a receptable provided for the purpose.

In older plants where this is not possible owing to the hot pit being jammed against the kettle brick work, a second loose fitting gate can be installed back of the main gate and the space between these two can be filled with cold stucco. This has been used and works very successfully in stopping kettle gate leakage.

By having a gate made of cast material properly machined and fitted to the machined face of the casting, which forms the opening of any kettle gate, leakage can be easily stopped entirely.

Fuel and Power Consumption

Calcining rock gypsum of a fineness of 95% minus 100-mesh, not previously dried, using oil for fuel and a 10x10-ft. kettle, which holds roughly 12 tons of raw gypsum, should show under normal conditions an oil consumption of 6 to 7 gal. per ton of finished stucco. The fuel consumption will depend upon the design of the firebox, cleanliness of wing walls and flues, amount of air admitted, etc.

Heat losses and fuel inefficiencies apply here as in any industry where oil is burned. Wing walls and flues are apt to become fouled due to kettle bottom leakage, which is carried into the flues by the draft.

The oil consumption on a kettle as above described can be kept at 6 gal. per ton of finished plaster, when oil is used for fuel. With natural gas the requirements will run as low as 750 cu. ft. per ton. At the prices for fuel on the Pacific coast the fuel will cost between 16 and 20 cents per ton of plaster.

This comparatively small charge does not give the rotary kiln much to shoot at in the way of a saving. Further with proper loading and discharging equipment one man can easily operate four kettles or a minimum of 400 tons per 24 hours. So there is not much

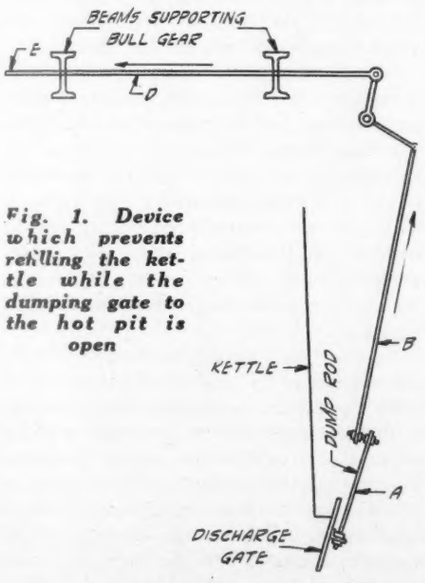


Fig. 1. Device which prevents refilling the kettle while the dumping gate to the hot pit is open

room for improvement here either. No doubt time, thought and inventive genius could be better applied to other problems of the industry, forgetting rotary kilns for the present.

The rotary kiln, however, does find usefulness in the industry in the manufacture of high temperature gypsum products, particularly Keene's cement.

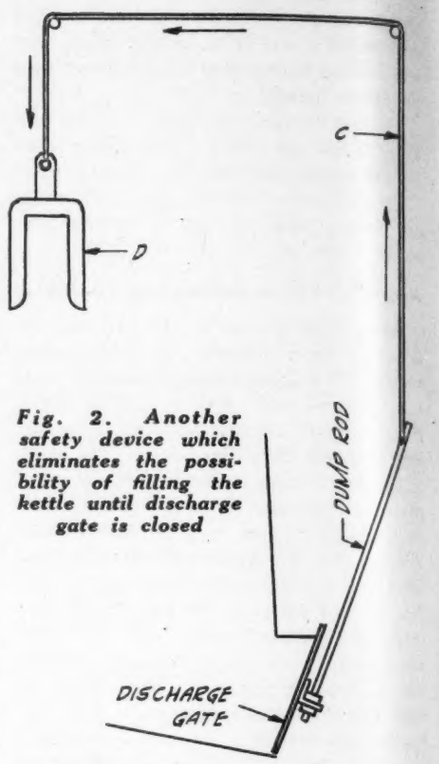


Fig. 2. Another safety device which eliminates the possibility of filling the kettle until discharge gate is closed

The duties of a plaster mill superintendent or chemist require eternal vigilance to the highest degree. Not only must the mill be kept clean and in good mechanical condition, but he must ever be on the alert to detect irregularities that would jeopardize the quality of the output, chemically speaking. Further, his organization must be such as to practically eliminate errors in shipping, errors in weights, etc.

The margin of profit is usually small, especially in localities where there is an abundance of gypsum; and hence many different companies bidding for the business. This means a small daily tonnage per mill. These factors preclude the possibilities of having a "staff" to maintain his quality. In most of the plants the superintendent is the whole technical staff.

In lots of ways there is a similarity between the duties of a lime or cement plant superintendenet and that of a plaster-mill superintendent. However, in the former two cases the variety of products shipped will usually be small; perhaps only one or two products. The plaster-mill superintendent has often as high as 50 different products (counting containers) to manufacture. One mill in the West (now defunct) had no less than four different brands of hardwall, finishing and casting plaster, all calling for their own particular kind of sack.

Storage in a warehouse at the mill of sacked material is not practicable on account of the large area needed for any appreciable tonnage and the cost of rehandling to be considered.

The gypsum business is daily becoming more competitive, new companies are entering the field, prices are dropping and the mill that can turn out a uniform, high grade

product is the one getting the business. Unless the mill is well balanced in its design and operation this condition cannot be attained. The designers are very often not asking the advice of the chemist, but prefer to treat the problem as a purely mechanical one. The great percentage of companies that have in the past gone bankrupt in this business can trace the reason for their failure to this cause.

Many companies employ a chemist and supply him with a sort of a laboratory, but sad to say his function is mostly to pose for the psychological effect his presence has on the trade. Or he may be required to set up a host of "mud pies" in the hope that he may catch accidentally a batch of defective plaster. This he rarely does. In case of a complaint he is rushed to the job again for the psychological effect, and at most all that is accomplished is another adjustment.

The place for the chemist is in the mill as superintendent, or in research, and his training and thoughts will then be directed to locating and correcting troubles at their source.

(AUTHOR'S NOTE—This finishes the notes on operation up to the mixing of the various grades of plaster; for stucco, single- or double-boiled, is the basis of practically all plasters. The different commodities are mixed with different things at the mixing and sacking department. The likelihood of troubles here call for a separate discussion.)

Efflorescence and Scumming of Mortar Materials

THE FIRST progress report on the efflorescence and scumming of mortar materials, based on a co-operative study between the Pacific Northwest Brick and Tile Association and the University of Washington, has been published in a recent issue of the *Journal of the American Ceramic Society*. The report contains a general discussion on soluble salts in clays, clay products and mortar materials and on the addition of barium compounds to make the salts insoluble. Twenty-one 4x4-ft. panels, 8 in. thick, were constructed of the same glacial-clay, red, face brick with variations in the following common mortar materials: sand, slaked lime, hydrated lime, and portland cement. Saturated brick was tried versus dry brick; sea water was used to replace fresh water; machine mixing of the mortar batch was tried against hand mixing, and various percentages of barium carbonate, barium hydroxide and barium chloride were introduced to make the calcium sulphate insoluble. Temporary scum or that obtained in the original drying of the wall was noted, and later or permanent scums, produced by artificial and natural soaking and drying the walls, were studied for over a year.

The general conclusions drawn from this study are:

Since water is the only carrier of soluble salts, the best preventive of mortar or wall efflorescence is the absence of water. It is well to avoid soaking porous brick any more than necessary and to permit the wall to dry out thoroughly before it is given its final cleaning. All brick work should be protected from leaking drains, cappings, sills, etc. While a heavy rain driven by the wind will penetrate, a light rain will have very little effect in producing scum. Sufficient water in contact with all our common mortar materials for a sufficient length of time will cause scum.

Portland cement and its products, concrete, artificial stone block, and cement brick, carry a large quantity of easily removed salts such as calcium hydroxide, calcium sulphate, and others which, up to the present time, have not been retained by the so-called waterproofing compounds. These portland cement products have large continuous pores through which dissolved salts and even calcium hydroxide in suspension can pass out to adjoining surfaces and produce discolorations.

Scum was produced with all of the mortars used in the present panel tests. Sufficient water and time for soaking was all that was necessary. The first and worst scum in the beginning was rich cement mortar. Salt water replacing fresh water in the mortar also gave a quick scum which probably in a long period of time will gradually be removed. It, however, produced a very weak mortar and should be avoided. The scum from lime mortars was only produced by large quantities of water in long contact with the interior of the wall. The type of scum produced from lime alone has not been seen by the writer on walls in use save those in contact with fresh cast stone, and therefore it is not believed to be a serious factor for ordinary brick work. However, it is better to use lime putty which contains no lumps of overburned or other slowly slaking portions which carbonate slowly and offer a continual supply of calcium hydroxide. Hydrated lime, because it has been screened, appears to offer a lime mortar which is freer from this defect than the common water-slaked lime.

Barium carbonate has proved effective in preventing the temporary efflorescence of calcium or magnesium sulphates. Barium carbonate will not prevent the scum from lime hydroxide suspensions from portland cement, cast stone, or other cement products, or from uncarbonated lumps of lime in lime mortars. It will not prevent the scum from salt water. While the more soluble barium salts act more rapidly, yet rapid action may not be necessary. Barium chloride, reacting with calcium sulphate, produces the soluble calcium chloride which will produce a scum itself. Barium hydroxide may be preferable because it produces calcium hydroxide or a form of lime putty. The extra cost of barium hydroxide has not yet been justified. The tests indicated that barium carbonate is effective under normal conditions in preventing or minimizing calcium sulphate scum from portland cement. This has been checked on large Seattle school buildings where the conditions are favorable for scum. Five per cent barium carbonate in terms of portland cement has been used successfully. It has been suggested (but not tried) that diatomaceous earth may combine with the free lime of the mortar materials to produce a more insoluble calcium silicate and reduce the temporary scum of lime hydroxide.

Barium salts only act on one type of efflorescing salts. Other compounds may be found to take care of the the remainder. A universal solution of the problem may lie in the development of a waterproofing compound which will not only fill the voids or surface voids of the mortar, but also of the brick and cement products.

The study is being continued on the chemical analysis and composition of the scums taken from the surface of the walls and leached in the laboratory from separate batches of the mortar materials. Preliminary analyses have already been made. The strength of the mortar materials to note the effect of barium salts is also under study. No deleterious effects have been found from barium salts.

Mineral Production in Canada for 1927

A NEW high record for mineral production in Canada was set in 1927, when the value of the output reached $241,773,000, marking a gain of one and one-third million dollars over the previous year's record total of $240,437,123, according to the official estimate compiled by the Dominion Bureau of Statistics in a recent preliminary report.

New output records for all time were established in 1927 in gold, copper, lead, zinc, cement, gypsum and lime, and in the value of natural gas and petroleum. Increased production, in comparison to the totals for 1926, is noted in the output of many metallic and non-metallic minerals, the latter including gypsum, quartz, cement, lime, stone, and sand and gravel.

At $42,000,000, the clay products, bricks, tiles and other structural materials, attained a total value in excess of the figures for any previous year. In this field the gain in the output of cement was the most outstanding feature. Lime output advanced to a new high record, reaching a value of $3,970,000 in 1927. Stone, sand and gravel were produced in greater quantities to meet the steadily growing demand for materials of construction. Building permits issued in 63 cities of Canada during the first eleven months of 1927, to a value of $112,175,268, showed an advance of about 2% over 1926.

Other non-metallic minerals, including more than a score of different commodities, valued at $16,874,000 in 1927, also reached a higher aggregate than in 1926. Among the more important members of this group are asbestos, gypsum, quartz (and silica brick), feldspar, mica, talc and soapstone, magnesite, and graphite.

The Cement Industry of Poland

Existing Plants Capable of Supplying Future Needs of Country for Some Time—Export Trade an Important Factor

By C. R. Platzmann
Berlin, Germany

POLAND'S cement industry dates back to the second half of the 19th century, the Grodziec plant having been built in 1858. A few years later, the plants of Wysoka and Podgorze were built and soon following nine other plants within the triangle bounded by the cities Krakow, Cieszyn and Czenstochau, belonging at the time partly to Austria-Hungary and partly to Russia. The boom was brought about by the discovery of Jurassic limestone formations in the vicinity of the Krakow and Debrowa coal mines. The plants Firley, Wolyn and Ros, located to the right of the Weichsel, also date back to this period. The former Neustadter, now Wejherow plant, located in what used to be West Prussia, was also added to the list.

Plant Capacity Increasing

At the outbreak of the World War the capacity of these plants, all of which are now situated in Poland, was about 950,000 tons. In 1925 and 1926 their capacity was estimated to be 1,200,000 tons and recent extensions have probably increased this to 1,400,000 tons.

The three plants located on the east side of the Weichsel were partly destroyed during the war. The plants Ros and Firley were rehabilitated in 1923 and 1925 respectively, but the Wolyn plant near Zdolbunowo was given up, as it had lost its former markets in Kiev and Podolia, which now belong to Soviet Russia. The capacity of the plants showed a tremendous increase of output (Fig. 1) between 1910 and 1914, a standstill during the war and a new rise since 1920. The number of plants and types of kilns are given below:

Name of plant	Type of kiln
Firley	Rotary
Grodziec	Rotary
Goleszow	Rotary
Gorka	Rotary
Klucze	Shaft
Lazy	Automatic shaft
Ogrodzimice	Shaft
Podgorze-Bonarka	Rotary
Ros	Rotary
Rudniki	Rotary
Szezakowa	Rotary
Wyerow	Rotary
Wick	Rotary
Wrzosowa	Shaft
Wysoka	Rotary
Wolyn	Rotary (not operated)

The raw materials used are composed of 72% limestone and clay, 18% marl, resembling in its composition the natural cement rock, and 10% chalk and clay.

The managements of the Polish cement plants have lately laid plans for modernization, thus assuring the production of a quality cement. As most of the plants were built between the years 1912 and 1914, and many others were rebuilt and renovated in 1920 to 1925, it is safe to assume that more than

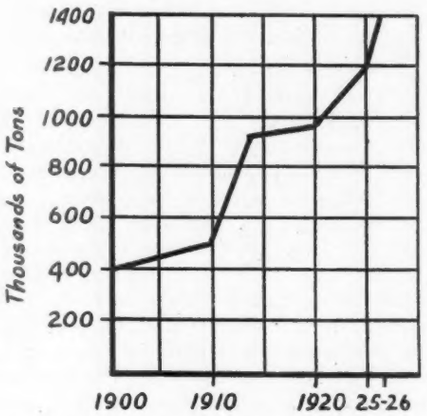


Fig. 1. Capacity of Polish cement plants, 1900 to 1926, inclusive

half of the entire number of plants dates back to times more recent than 1912. A proof of this is the high percentage of rotary kiln operations.

Polish cement is generally of good quality, sets and hardens comparatively rapidly and about 75% of all manufactured cements acquire strengths at 28 days of up to 500 kg./cm.^{2} (7100 lb./in.^{2}). The actual production from 1912 to 1926, inclusive, is shown graphically in Fig. 2.

Low Per Capita Consumption

The consumption of cement per capita of population in Poland is 16 kg. (0.094 bbl.) annually as against 70 kg. (0.41 bbl.) in Germany, 80 kg. (0.47 bbl.) in Scandinavian countries and 220 kg. (1.30 bbl.) in the United States. The relatively low value in Poland becomes clear when one considers the main fields of use of cement in that country. These may be classified as follows:

(1) Government and municipal construction.

(2) Industrial buildings.

(3) Private users, of which 75% reside in rural districts.

During the time of Polish inflation in 1920 to 1924 it was impossible to carry on the construction of public buildings. When new currency was introduced by Grabski in 1924, an effort was made to stabilize its value by reducing to a minimum the construction of such buildings, which naturally resulted in reduced cement consumption.

The immediate consequence of the currency standard reform was an acute economic crisis, which caused the cement consumption by the industry (chiefly from the coal mines which ordinarily absorbed up to 150,000 tons), to drop to one-half of its usual amount. The shortage of capital naturally limited the construction of rural buildings. These conditions were aggravated by the crushing pressure of very high taxes. The war damaged buildings in eastern Prussia were restored entirely by timber construction. Foreign capital was awaiting further results of the currency reform before placing larger investments in Polish enterprises.

Although this crisis has not been completely weathered as yet, it is declining rapidly. In connection with the industrial crisis, the government began to erect a number of important structures to solve the problem of unemployment in the country. Among these were the Gdynia harbor, a railroad net and the construction of a canal, which is to connect the coal district with

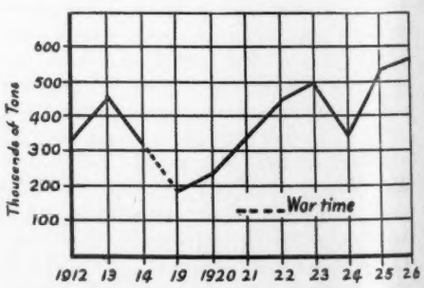


Fig. 2. Production of cement in Poland, 1912 to 1926, inclusive

Warsaw and the sea. The good crops of the last two years have contributed greatly to the resumption of building in rural districts. Finally, foreign capital began to take an interest in the development of the country.

Attempt to Increase Cement Exports

The Polish cement industry has also tried to increase its exports. Low cost of fuel and low wages permit it to enter in competition with other countries, in spite of unfavorable geographical location. Four Polish plants — Goelszow, Szezakowa, Ros and Wolyn—had established markets in Austria

and Russia before the war, but lost these since the world crisis. The Danzig harbor is 600 to 700 kilometers (375 to 435 miles) distant from the industrial district, so that cement must be shipped by rail with consequent high freight charges before it can be shipped from Danzig. Aside from this, Danzig can supply only countries with which it is connected directly by shipping routes. The high cost of railway transportation to other ports such as Hamburg, Rotterdam or Antwerp eliminates these cities as possible users of Polish cement.

Recognizing the value of cement export for the trade balance of the country, Poland reduced freight charges for cement to Danzig and other cities along the border in 1926. An extension of the Danzig harbor and the construction of the Gdynia harbor have increased the number of shipping lines and admitted Poland to the trade channels of the outer world. As a result of this the export of Polish cement is already being felt in Germany and is continually increasing. It rose to the following figures:

1925.....11,381 tons valued at 395,000 Zloty
1926.....41,120 tons valued at 1,469,000 Zloty

The present year is witnessing further increase of exports, as the cement exported via Danzig in June, 1927, amounted to 8300 tons and in July to 14,174 tons.

The construction of a new railroad from Polish Upper Silesia was begun in 1926. It will reduce the distance to Danzig by almost 100 kilometers (62.5 miles). The present prices of Polish cement at Hamburg are:

From	Price—Zloty per 100 kg.	Price—*Dol. per 376 lb. bbl.
Warsaw	8.60	1.28
Lodz	8.20	1.22
Krakow	7.60	1.14
Lemberg	8.90	1.33

*$1 = 11.60 Zloty, November 28.

On the other hand the Polish government has enforced a protective tariff of 1.17 marks per 100 kg., which has been increased by 100% on December 26, 1927.

Co-operative Marketing

The marketing of cement up to May, 1926, was handled by an agreement of the Warsaw and Krakow trade centers dating from January 1, 1925. Yet as early as the middle of 1925 an independent cement plant, the Firley plant in the Lublin district, was set in operation. A competitive war began which threatened to become fatal to the entire national cement industry. Lengthy parleys brought about an understanding in the Polish cement industry and on January 1, 1927, there was inaugurated the Zentrocement, Ltd., with headquarters in Warsaw, through which all cement plants are to market of their products for the next four years.

[According to W. T. Daugherty, trade commissioner, Berlin, Germany, representatives of Polish, German and Scandinavian cement industries met in Berlin recently to negotiate an agreement on export markets against over-production. His conclusions are that a Polish-German cement understanding is contingent on commercial treaty negotiations.

It is also reported by H. E. Carlson, consul at Tallin, Esthonia, that two Esthonian cement mills are about to request the Esthonian government to increase the duty on cement. The reason is advanced that Polish cement is now being sold in Esthonia at such low prices that the cement manufacturers are convinced of an attempt to dump Polish cement on the Esthonian market. It is said the duty on cement is to be increased to a point which will make up the difference between current prices of Esthonian and Polish cement.—Editor's Note.]

European Cement Industry

THE DEADLOCK between German and Belgian cement producers vis-a-vis the Holland market may have been relaxed by the French-Belgian-Luxemburg treaty, according Belgium a better outlet for its cement export to France. This being the case, Belgium may be better disposed to treat with Germany on the basis of a better division of the Holland market. This agreement pertains to the French continental market only—to the exclusion of the French colonies. By its terms Belgium is permitted to annually dispose of a fixed quantity of portland cement in France. As an indemnity for not exceeding this amount the French cement manufacturers agree to pay to the Belgian cement plants a fixed sum. This fixed sum is in addition to the price received from the sale of Belgian cement in France. The French cement manufacturers also agree to keep out of the Belgian and Dutch markets.

The latter division has also been affected so far by the threatened dissolution of the West German Cement Association. This combination, however, decided on December 16 to prolong its treaty for one more year, but without admitting any new works to its ranks. An earlier report stated that the Wickingsche Portland-Zement-Wasserkalkwerk of Muenster, which dominates the West German cement cartel, decided to leave the West German cartel on December 31, 1927, in order to enter the open market free from conventional price ties. The Wickingsche Works felt that this was the best method of competing with the natural cement producers who were undermining their trade in West Germany.—W. T. Daugherty in *U. S. Commerce Reports.*

French Cement Industry

PRODUCTION of cement has been reduced in the principal centers of France, the vice consulate at Boulogne-sur-Mer reporting that there is now a five-day week in most plants and a four-day week in a few others. The consulate at Calais reports current production of the entire Department of Pas-de-Calais as about 125,000 metric tons a month, 95% of which is artificial portland cement. Production in the Nord is far below normal.

No declared exports to the United States are reported, but exports continue in fairly normal volume to Great Britain and to the French possessions in Africa. Exports from Bordeaux amounted to 716 metric tons in the first nine months of 1927, and from Calais to 18,457 metric tons during the first 10 months, of which 895 were in October.

Domestic prices remain unchanged, but there has been a weakening of export prices. The consulate at Calais reports that the export prices to England, f.o.b. Calais, declined from 26 shillings ($6.33) per metric ton in September to 25 shillings ($6.08) in October.

The general situation of the French industry is unsatisfactory. The immobility of domestic prices is, in some districts, more apparent than real; certain mills cut prices outright, whereas others grant variable rebates. The consulate at Lyon reports that experiments are being made with paper bags as containers, in an effort to reduce costs and bring down prices.—A. D. Cameron, vice consul, Paris, France, in *U. S. Commerce Reports.*

Accidents in the Quarry Industry in 1926

A SLIGHT increase in the death rate from accidents and a small reduction in the injury rate occurred in the stone quarrying industry in 1926 as compared with 1925, according to reports received from operating companies by the United States Bureau of Mines, Department of Commerce. The death rate, based upon a standard of 300 days of exposure to risk, was 1.87 per thousand employes as compared with 1.78 in the preceding year. The injury rate was 160 per thousand as against 170 in 1926.

For purposes of the bureau's study of accidents at quarries, the reports were classified into seven main groups, according to kind of stone produced, as follows: limestone, marble, slate, granite, sandstone, cement-rock and trap-rock. Reduced fatality rates were reported for quarries producing cement-rock, sandstone, slate, and trap-rock and lower injury rate were reported for quarries that produced cement-rock, granite, sandstone and trap-rock.

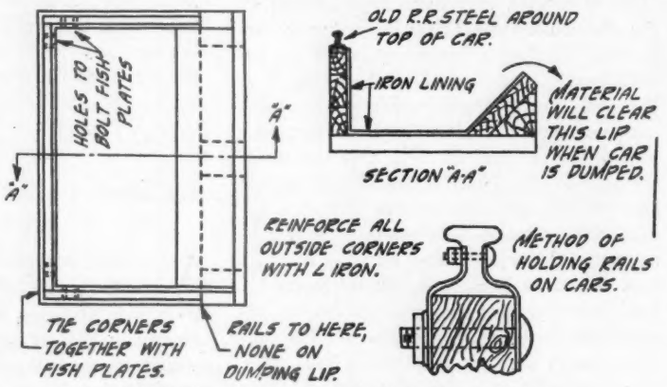
The quarry industry as a whole employed 91,146 men who worked 24,708,400 shifts, both of these figures being slightly smaller but substantially the same as in 1925. The volume of employment was equal to 271 workdays per man, as compared with 273 in the previous year. Accidents at the quarries, crushers and other outside plants resulted in the death of 154 employes and the injury of 13,201. Most of the fatal accidents were caused by falls or slides of rock or overburden, by explosives, electricity, machinery, haulage and by falls of persons. Most of the non-fatal injuries—all of the injuries being what are called "lost-time" injuries because they caused the employe to lose time from his work—were from causes similar to those resulting in fatalities.

Hints and Helps for Superintendents

Good Dump Car for Shovel Loading

By W. L. HOME
Consulting Engineer, Pine Plains, N. Y.

THERE are still many four and six yard two-way dump cars in quarry service. The type I particularly refer to has doors on each side that open when the car dumps. For general industrial work where the cars are dumped in different places these doors are necessary and must be maintained in good working order. However, for crushing plant service where the cars are always dumped from the same spot, right into the crusher and generally always dumped from the same side, the doors and the various assortment of irons and levers that go with it cause a lot of delay, maintenance work. This type of car is excellent for steam shovel loading in a quarry but rather than keep the doors in repair it is better to provide a way to dump the cars and leave the doors off. Such cars rebuilt as shown in the sketch with light rails around three sides of the car, well built and reinforced properly will not need to go to the repair shop very often and when it does it is not so difficult to put in condition as the other type.


HOLES TO BOLT FISH PLATES
"A"
"A"
OLD R.R. STEEL AROUND TOP OF CAR.
IRON LINING
MATERIAL WILL CLEAR THIS LIP WHEN CAR IS DUMPED.
SECTION "A-A"
REINFORCE ALL OUTSIDE CORNERS WITH L IRON.
METHOD OF HOLDING RAILS ON CARS.
TIE CORNERS TOGETHER WITH FISH PLATES.
RAILS TO HERE, NONE ON DUMPING LIP.

Method of building door-less dump cars

The Selection of Foremen

WE have just run across a newspaper clipping which we took nearly a year ago from the *New York Commercial,* now combined with the *Journal of Commerce.* Since we have not used it before, and it is still good and fresh, and always will be good and fresh, we are passing it on to you herewith:

It has been the experience of practically every man in a supervisory position to have an otherwise good employe spoil himself and his chances for further advancement by contracting the "big head" over some minor promotion or the simple addition of responsibility or authority. Men of mediocre minds seem to feel that to qualify for a foremanship or to successfully complete a probationary period, he must be a driver. And there is a great difference between a driver and a leader.

The leader is a man who is human and treats all others as though they might also be human. He is the one who briefly and clearly tells what he wants done, shows or demonstrates what is not understood, and gets results. The driver is the "do this" and "do that" sort of an individual. He explains nothing, then gets angry if the work is improperly done. Never supplementing instructions with explanations, he is wont to think of his men as "d—— dumbbells" because they cannot read his mind or properly guess at methods. The driver is the man who believes in the doctrine of keeping a man "scared of his job," not infrequently discharging a man for the purpose of further instilling this fear. The driver gets results after a sort—but it is a poor sort, for invariably there develops a row in the departments that affects the entire organization.

There is only one thing to do with these two men: promote the leader and demote the driver.

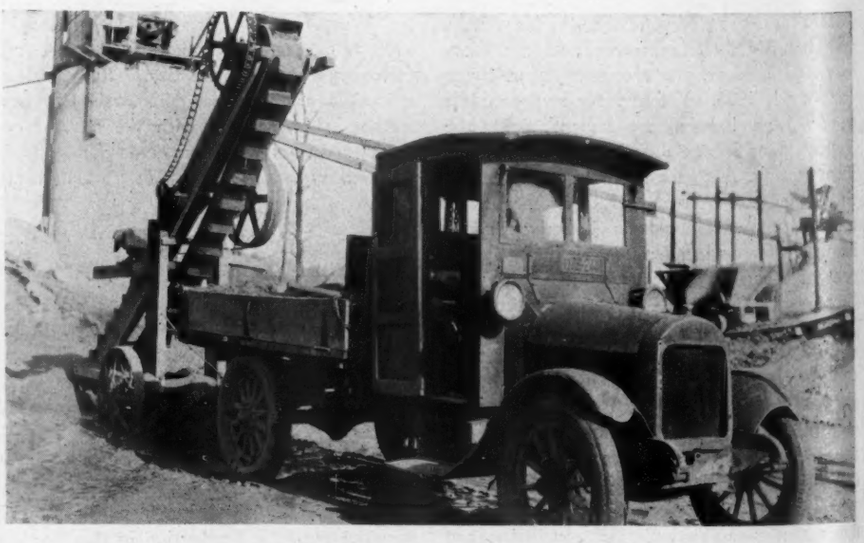
The fact that a man is a driver is no indication that he has courage. Courage is a basic essential to good foremanship. Without it no one can hope to get results or be a successful leader. But courage is never of loud-mouthed bossiness. Every foreman must have the courage to tell his men what to do and what not to do. The difference in the results usually lies in the manner of telling. Courage and a human heart is the best possible combination, while the "courage" of blind driving force will not only break the foreman but probably the entire department.

Among our acquaintances there is a man who is liked and respected by each of his nine foremen and 185 men. This superintendent ever keeps before him this fundamental principle: human nature is imperfect. He never expected any man to do any work in just the manner he would have done it himself. He knew that no foreman could ever measure up to the high standards he would like to see in the men. That superintendent was honest, truthful, courageous, conscientious, and was endowed with humanity tempered by common sense. Many of his foremen affectionately refer to him as "the man with uncommon sense," and not a foreman does he have who does not, at least unconsciously, follow in his footsteps.

The firm for which this superintendent is employed is nationally known among engineering and manufacturing concerns and has large plants in various parts of the country. The labor turnover in the plant this man superintends is lower by 30% than in any one of the district factories. Therein lies the value of good foremanship.

Bucket Loader Built at the Plant

A HANDY bucket elevator loader for sand or gravel can be built right at the plant. The frame work is made as shown with two long side pieces inclined at about 45 deg. and supported in the middle of their lengths by uprights attached to a pair of wheels. There are also horizontal braces from the axle supports to the ends of the inclined pieces at the foot of the bucket elevator. The elevator belt is home-made with buckets riveted to an old belt. Power is furnished by a small electric motor supplied with cur-



Home-made bucket elevator loader

rent through an extension cord. The motor is mounted over the belt and back of the wheels so that it balances the weight of the extended portion at the top. The elevator belt is driven at the top, through a belt drive from a small pulley on the motor to a large pulley on the frame, which in turn drives a small sprocket on the same shaft and this is fitted with a chain to the large geared wheel which moves the belt. Thus by this double reduction the high speed of the motor is reduced to the speed required to drive the loader. This device will load a truck easily and quickly from a stockpile at little cost. The loader was built at the plant of the East Peoria Sand and Gravel Co. of East Peoria, Ill., and it has operated satisfactorily.

Repairing a Gyratory Crusher Shell by Welding

THE shell of a large gyratory crusher at a western metal mine was broken completely around the circumference, a distance of 15 ft. It was decided to attempt to repair the shell by oxy-acetylene welding. The first work was to chamfer the edges of the 15 ft. crack. While this was in progress a means of supporting the casting while it was being preheated and welded was determined. The casting weighed 5 tons and it was necessary to revolve it while the welding was being done, since the crack went completely around the circumference, so it was arranged to fit a large diameter pipe through the shell to form a hollow axle. The pipe fitted the central opening at the upper end of the shell, and at the base short lengths of pipe were welded to the large pipe at right angles to hold it in position. Then with three railroad rails through the pipe, their ends resting on heavy cribbing, the casting could be turned even when red hot. A furnace was built around the casting, and the preheating was done with a wood fire, and with a oil-burning preheating torch.

The welding work was done from platforms on either side of the furnace, necessitating long-handled blowpipes and asbestos equipment for the operators to withstand the furnace heat. Three days were required for the job, the casting being kept hot at night while the welders were off the job.

When the circumferential weld was completed, the base was exposed and turned so that the worn sides of the outlet port could be welded. On one side a cast iron patch had to be welded in. On the other, it was necessary to fill up a trench 2 ft. long, 6 in. wide and 2½ in. deep. This was also hot work, as the port extended inside the shell. To facilitate reaching inside, a stick about 6 ft. long was wired to the blowpipe handle and a wire from the handle to the casting above helped to balance the blowpipe.

The work was apparently entirely satisfactory, and the cost was found to be only about half what the replacement cost would have been. The spider of the crusher which was broken when the shell was smashed was also repaired by welding.—*Oxy-Acetylene Tips.*

Protection for powder magazine

Safety Precaution for Powder Magazines

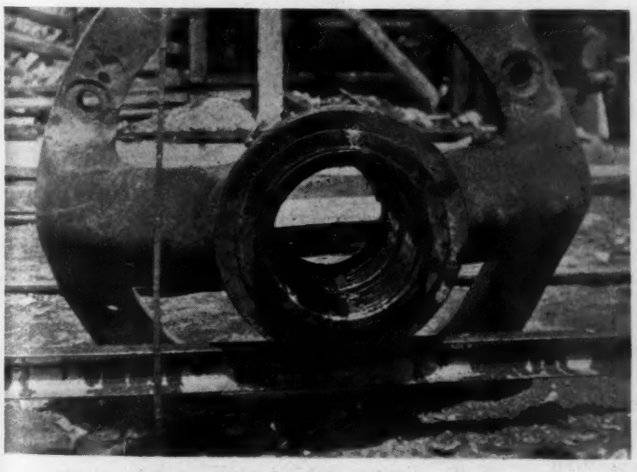
THE accompanying view shows how one user of explosives has taken precautions against the possibility of injury to workmen or equipment should the dynamite in the magazine be set off by accident. A bank of earth, practically as high as the top of the magazine, has been thrown up around the building to prevent, as far as possible, the force of accidental explosion from reaching the surrounding territory. The picture was taken at the crushing plant of Foley Bros., Inc., at Fort Lee, N. J.

A description of Foley Bros. operation was published in ROCK PRODUCTS, November 26, 1927.

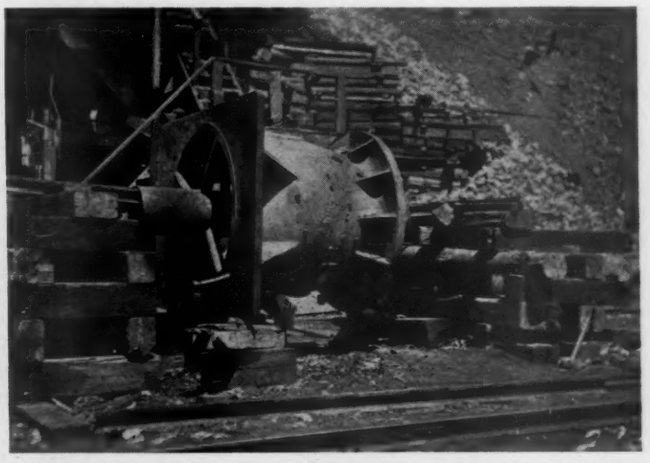
Protection of Rotary Screens at Crushing Plants

THE rotary screen in many plants is a much abused piece of equipment, protection against dust entering the moving parts such as tires, trunnions and bearings being quite insufficient. Naturally oil and grease cannot function properly under such dusty conditions and as a consequence the tires and trunnions wear rapidly, leaving another piece of equipment for the scrap heap.

To be sure, the screening plant is a dusty place unless a dust collecting system is installed. In all cases, the screening plant should be partitioned off or separated from the crushing plant so as not to add more dust in the screening department. The screens should not be covered, for then the dust is trapped in the screens; it is better to cover the bearings and keep them well oiled. Ventilation of the screen house is of great assistance and when conditions are still too dusty for men and machinery, an exhaust fan is cheaper than replacements of worn parts due to dust. The principal rule to observe under all conditions is to keep the dust out and not to trap it in—a principle which will give fewer replacements.



Spider of the crusher after welding



Crusher shell showing the weld

Progress in Research and Technology of Rock Products in 1927

A Summary of Abstracts and Scientific Papers Published During 1927

THE outstanding feature of 1927 was the aptitude which the technicians in the rock products industries showed in tackling the problems awaiting solution. To be sure, not all of them were definitely settled, nor are they expected to be soon, but the foundation on which the research has been built is more secure than ever. At the least, definite progress has been made and our knowledge of the chemistry and physics of rock products correspondingly increased.

Composition of Cement

Cement, being the oldest (in the point of investigation) and the most important of these industries, was the basis of considerable research as to composition. A joint investigation by Hansen, Dyckerhoff, Ashton and Bogue (**8**, 67) gave results that contradict Janecke's assumption that the ternary compound, $8CaO \cdot Al_2O_3 \cdot 2SiO_2$ (Janeckeite) is present in stable equilibrium in the lime-silica-alumina system. The needle-shaped crystals, designated previously as a ternary compound, were found to consist of tricalcium silicate. Janecke (**24**, 99) in a reply to the above refutes the findings, claiming that they were based on the decomposition products of the 8:2:1: compound. He suggests that the 8:2:1 compound has a lower stage of existence, but even this is doubtful, for it fuses at 1850 deg. C. and would then exist only at certain ranges and be unstable at lower temperatures. Normal portland cement clinker was found to have a maximum lime content expressed by the molecular ratio, SiO_2:CaO=1:2.65 (**20**, 96), which agrees with Dyckerhoff's statement that alite is β-bicalcium silicate with about 0.5 mol. of CaO in solution. Kuhl (**22**, 103) is of the opinion that alite is a solid solution of highly basic calcium silicate and a highly basic calcium aluminate with possible lime in solution, hence he suggests Dyckerhoff's recommendation that alite be called calcium silicate and belite tricalcium silicate, is entirely unfounded. Luftschitz in a new published work (**22**, 102) agrees with Kuhl, presenting a structural formula for portland cement which he says fits the "kaolinized" state of the compounds. Hansen and Bogue studied combinations of lime in portland cement compounds, using a base composition of CaO 67%, Al_2O_3 10% and SiO_2 23%. They found replacements of MgO for CaO and Fe_2O_3 for some of the Al_2O_3 (optimum 3%) promoted the combination of lime, the mixture of both being more effective than either alone. Combination of lime was effected only to a limited extent by soda and potash. Ullrich (**8**, 60), Rodt (**19**, 92) and Goslich (**18**, 96) reviewed the work of German investigators in portland cement research.

French investigators pointed out that the hydraulic properties (**1**, 80) of the iron and alumina cements are due to complex compounds in which the several atoms of silica are bound in the same molecule. The hydraulic bonds are all considered to be insoluble lime combinations, some of the silicates, the aluminum compounds and the titanites. Grun (**7**, 74) found potassium mono-aluminate in cement was the chief reason for property changes of cement when varying gypsum admixtures were employed. The CO_2 from the air combined with the potash to make K_2CO_3 which accelerated the setting, hence more gypsum had to be added to counteract this.

Editor's Note

THE numbers in parentheses accompanying the condensed reports given herewith refer to the issue number and page on which more information on the subject can be found. For example, 1, 36 means January 8 issue, p. 36, and for convenience the publication dates corresponding to the issue numbers for 1927 are given below:

No. 1	Jan. 8	No. 14	July 9
No. 2	Jan. 22	No. 15	July 23
No. 3	Feb. 5	No. 16	Aug. 6
No. 4	Feb. 19	No. 17	Aug. 22
No. 5	Mar. 5	No. 18	Sept. 3
No. 6	Mar. 19	No. 19	Sept. 17
No. 7	Apr. 2	No. 20	Oct. 1
No. 8	Apr. 16	No. 21	Oct. 15
No. 9	Apr. 30	No. 22	Oct. 29
No. 10	May 14	No. 23	Nov. 12
No. 11	May 28	No. 24	Nov. 26
No. 12	June 11	No. 25	Dec. 10
No. 13	June 25	No. 26	Dec. 24

Clinker Composition

Gillson and Warren (**2**, 39) showed clinker to consist of three different crystalline compounds making up about 95% of the mass. The optical properties of two of these differ from members of the lime-silica-alumina system of Rankin and Wright; the third compound is found also in set cement and concrete, showing it to be inert. Goslich's (**15**, 88) microscopic study corroborates Tornebohm's analysis, viz., portland cement having four compounds, CaO, Al_2O_3, SiO_2 and Fe_2O_3, instead of three, as commonly assumed. Guttman and Gille (**24**, 98) in a crystallographic study determined five clinker constituents —alite and belite in the main, celite (strong colored, isotropic constituents), free lime as crystals and colorless glass. Free aluminates, with one exception, were not found in the clinker. The data are insufficient to connect the initial strength with the quantities of alite and belite present. Le Chatelier testing high alumina cement (**22**, 90) found three main aluminates: $CaO \cdot Al_2O_3$, $5CaO \cdot 3Al_2O_3$, $3CaO \cdot Al_2O_3$, and two possible silicates: $2CaO \cdot SiO_2$, $2CaO \cdot Al_2O_3 \cdot SiO_2$. A recent mineralogical examination (**1**, 80) shows aluminous cement clinker to consist for the most part of gehlenite, mono-calcium aluminate and some tricalcium aluminate, the ratio between alumina to lime being as 1:1.05-1.10 in the mono-aluminate. Ullrich (**9**, 76), studying the effect of calcination time and temperature on the properties of cement, found the ultimate strength to be more a function of the calcination period than the temperature, and that the carriers of the hydraulic properties are isomorphic mixtures or solid solutions of $3CaO \cdot SiO_2$ with $3CaO \cdot Al_2O_3$, the extent of solution being the determining factor.

Hydration and Hardening

Hauenschild in a series of extensive tests (**9**, 62) on the effect of fineness of cement on the rate of hydration, determined that the rate increased with increasing surface area of decreasing sizes, particles 15-18u in diameter hydrating completely, all the clinker minerals being altered. The properties and chemical composition of the clinker were other influencing factors, single crystals hydrating more rapidly than particles of equal size made up of different clinker minerals. Beckmann, hydrating pure $2CaO \cdot SiO_2$ and $3CaO \cdot SiO_2$, regarded setting as a colloidal process taking place in two stages—the $3CaO \cdot SiO_2$ considered as $2CaO \cdot SiO_2 + CaO$. The first step in setting, he states, is coagulation of the 2:1 compound, and the second, a parallel strong exothermic hydration of CaO dissolved in this compound. Other investigators working on high alumina cements (**19**, 51) believe the cementing properties are due to precipitation of hydrated alumina, formation of crystalline hydrated tricalcium aluminate

and a metastable and supersaturated monocalcium aluminate solution. Others consider hardening to be a function of time and humidity (3, 83), and suggest that "super" cements should not be ground too fine, otherwise cracking due to internal strains from evaporation of the water at high temperatures will result. The quantity of water absorbed and changes in specific gravity of the cement and set product (3, 83) are used by one investigator as a means of measuring the quality of cement.

Prussing experimented to find a method whereby relative viscosity (6, 82) of cement slurry could be expressed numerically and a simple method of regulating the viscosity. He determined that the extent of oxidation of the Fe constituents of the shale influenced the viscosity of the mass when alkalies were added to the slurry. The tensile strengths of different cements were found to be consistent to the grades at a test (4, 76) conducted at the Kansas Agricultural College. Further there was no close agreement between the tensile and compressive strengths, a high tensile not necessarily indicating proportional compressive strength.

Becker in a comprehensive article (18, 84) finds fluorspar admixtures to cement raw material not harmful but beneficial, inasmuch as it lowers the sintering point and gives other desirable properties to the clinker; increases rate of hardening. Bates says high lime cements (21, 69) may be produced by reducing the SiO_2 content without changing the iron and alumina, or by replacing part of the alumina with Fe_2O_3. Cements up to 71% CaO could be made by the latter method. The Bureau of Standards is investigating rare earths for use in making quick-hardening cements, and Bates suggests magnesium oxychloride cements, zinc oxyphosphate compounds as a future source. The barium earths (21, 69) have been investigated and the compound $2BaO \cdot SiO_2$ found to have hydraulic properties. The need, according to Bates, is for an efficient catalyzer to hasten hardening of cements.

Hartner working on the specific heat of clinker (5, 74) found that above 950 deg. C. it could not be checked, and concluded the system to be non-homogeneous, the components melting above 950 deg. C. and adding their respective heats to the reaction. The Ernsts reported the changes taking place in different positions along the length of a rotary kiln (3, 62). Kiln rings, according to Biehl (22, 102) may be avoided by uniform fine grinding of raw materials, keeping the lime contents of the mix high rather than low, using low-sulphur fuel uniform in quality and low ash and maintaining a good draft. These conclusions are based on chemical analyses of rings. The use of composite fuels is suggested (1, 80) to prevent sticking of the ash.

The Bureau of Standards has found cements containing as high as 6.5% magnesia (21, 76) satisfactory. A Swedish inventor, Lanz, makes a high magnesia cement (22, 100) by grinding clinker with gypsum and rapidly passing it to a second mill where more gypsum is added up to 6% of the total. Limestone, zinc retort ashes and coke are calcined at 1000 deg. to produce a hydraulic cement, according to an English patent (17, 83). Accelerated burning (13, 84) results if Fe_2O_3 is added as an oxygen carrier, another suggests. Calcium chloride mixed with colloidal silica, the mix evaporated and ground and the final product used as a cement admixture (17, 92) to regulate the set is proposed. Garre uses small amounts of lead oxide (16, 82) as a set retarder, large amounts giving unsound products.

Physical and Chemical Analyses

Hart describes an accurate and rapid quantitative method (11, 90) of determining silica by means of a membrane filter. A thermal method (2, 98) has been proposed for calculating the lime content of inert and set cement.

Drury has translated the clinker analysis through formulas (17, 60) to the various complex clinker compounds. A quicker method of proportioning raw cement mixes through the use of triangular co-ordinates (21, 73) is proposed by Ernst. Dickinson has developed an elutriator (23, 52) for testing cement particles below 200-mesh. Faircloth has designed an adjustable dash pot for use with the regular Vicat apparatus, the Bureau of Standards a constant temperature humidity box (8, 67) for storage of cement specimens, and Committee C-1 of the A. S. T. M. is discussing the use of a neat cement paste as a test for purchase in place of the usual concrete. Haegermann did some excellent work on a comparison of English and German sieves (12, 103), and Platzmann has completed a critical review of standards used by 24 different countries. German (24, 93) American (20, 77) Canadian and Belgian standard specifications for tensile and compressive strength were raised this year.

Cement Patents—Admixtures

A British patent (16, 92) uses slag, clinker and anhydrite to produce a high-lime quick-hardening cement. The production of alumina cement in rotary kilns is covered by several patents. Spackman (14, 97) uses an equal mix of bauxite and alumina with an oxidizing current such as steam. A reverbatory furnace method (4, 81) and an electric chamber process (1, 80) are of interest. Alumina cement and potash as a by-product (4, 81) are produced in the rotary kiln calcination of alunite, coke and limestone. The "super-cement" patented by Goddard (7, 81) and used with success by the British during the World War is being made in the United States by several portland cement companies. In this cement, part of the gypsum added to the clinker is replaced by a gypsum-gallotannin combination.

Another invention calcines a mixture of bauxite and limestone or hydrated lime (1, 79) in a rotary kiln at a comparatively low temperature (900-1100 deg. C.) but for a long period of time. Natural aluminum silicates or alkalies and silicates to which calcareous material and more aluminous ingredients are added and the whole fused is the basis of a French patent for alumina cement (4, 81). A cement said to be resistant to sea water (1, 79) is prepared by grinding blast furnace slag and alumina cement clinker. The French grind burned gaize (a sedimentary, clayey high silica rock) with the clinker (15, 88) to accomplish the same purpose.

Unsintered Hydraulic Cements

Unsintered hydraulic cements have been in patent literature for many years and the subject of much discussion. In many cases colloidal silica (7, 80) is proposed as the active ingredient, and a German method uses a combination of lime and the by-product of alumina manufacture to make an uncalcined hydraulic cement. Another proposes calcining anhydrite and silica in the presence of steam to make cement and SO_2 gas as a by-product. A quick-hardening, strong cement is claimed to result from heating at a low temperature a mixture of lime hydrate, calcium aluminate, aluminum sulphate and magnesium carbonate (1, 98). Calcination of a lime-clay mixture at a temperature below sintering (9, 76) and the Kern patent (9, 77), which uses limestone and silica and a steam-tunnel, are of interest.

Luftschitz added colloidal silica to red-hot clinker (14, 96) and got a product of increased strength. He suggests using this form of silica with underburned cements, for it is best where free lime is present.

Improved Cement Kilns

Most of the new devices had to do with the treatment of slurry. Loeffler and Eichenlaub (6, 62) proposed a combination slurry dryer and clinker cooler, Jorgensen (13, 85) dried the slurry in the preheater and crushed it before feeding to the kiln. One method which appears to have possibilities sprays the slurry into the kiln by an atomizing nozzle (1, 79). Other slurry treatments of interest are referred to the reader—Cf. 3, 83; 8, 92; 16, 83.

Sealed kilns are suggested in several instances, the Stehman system (2, 98) being the most prominent. An automatic shaft kiln with waste heat attachment in which the fuel and raw cement materials are blown in, and other novel features, are contained in Naske's patent (13, 84). Huyl (11, 91) would do away with the usual kiln by blowing a jet of dry materials into a chamber so as to meet a flam-

ing jet from the other side. The inventor proposes this as a lime-burning method also.

At least two novel coolers are the basis for patents; one by Speed (8, 93) uses an endless chain grate in a confined chamber with recirculated forced air draft and waste heat boiler. The Vickers patent (8, 92) has a kiln extension with ports through which to pass the hot clinker to small rotary coolers rotating with the kiln shell. The discharge ends are open so that incoming air cools the clinker.

Lime

The year marked the first lime symposium at an American Chemical Society meeting (April 30 issue), but it also saw the passing of the research bureau of the National Lime Association. Several studies begun in earlier years were brought to a completion, one of the important being the effect of steam in lime kilns. Berger reported steam had no effect on the rate of calcination (14, 78) but was effective in producing mild burning and preventing clinkering of the ash. The calcining proceeds at lower temperature, but this Berger concludes is not due to any physical or chemical reaction in which the steam takes part. Azbe (7, 65), in a separate study finds steam not helpful to calcination; in fact, a hindrance.

Plastic Hydrates

Mathers and Briscoe (3, 51) found by controlling the time and temperature of burning and the rate of hydration, plastic properties of limes could be improved. In some cases treatment of the stone with a salt solution would give plastic limes. Farnsworth showed by x-rays (17, 62) that $CaCO_3$ was always present in limes of low plasticity, and x-ray pictures could be used as a method of direct measurement of plasticity of any lime. Rinne's work with x-rays was of a similar nature (13, 65). Azbe found recarbonization could occur at temperatures below decomposition (16, 54) and the MgO in dolomite to be unaffected, consequently he suggests this as a method of making MgO from dolomite. Data gathered by Budnikoff (13, 84) indicate that the rate of solution of CaO is dependent on the temperature of calcination. The rate of solution was measured by a specially developed electrical conductivity method. Colloidal silica is recommended by Luftschitz (14, 96) as an addition to lime mortars to give them hydraulic properties and increased strength. A new and faster soundness test (14, 74) for hydrated lime has been developed at the Bureau of Standards.

Plastic hydrates from any lime are claimed by Dittlinger's patent (19, 84), which adds chemicals to the slaking water. Carson (3, 69) grinds the lime to about 100-mesh and quickly adds water in limited quantities, keeping the slaking temperature within 100-115 deg. C. to get plastic hydrates. Another patent discharges the hot lime direct from the kiln to excess cold or hot water and dries the hydrate (17, 83).

Quick-Setting Limes

Wood has patented a fibered lime (18, 97), the dry lime being ground with sisal. Ready-mixed dry quick-setting lime plaster (7, 93) is made by one inventor, of lime hydrate and pellets of magnesium or sodium carbonate, the pellets being covered with a thin coating of starch or gum arabic to render them resistant to moist air. Knibbs' patent for quick-setting lime blocks or slabs (10, 92) grinds the lime to 30-mesh and passes it to a rotary kiln where it is partially recarbonated at 800 deg. C. The product is ground fine and then mixed with lime or hydrate and cast into blocks or slabs. Another patent pulverizes the lime in a pug mill with pumice, or slag, peanut shells or fiber as filler along with the gaging water. The block is made under pressure and allowed to set in air (17, 83).

Kiln Improvements

Some improvements in kiln design were noted, the Ward kiln (8, 93) offering a method of burning spalls along with regular sized stone. Barton described a gas-fired lime kiln controlled from the instrment room (7, 34). Halloway patented an electric rotary kiln (1, 79 and 9, 76) for calcining either limestone or gypsum. A novelty in manufacture is Huyl's process (11, 91), which blows jets of dry pulverized limestone into a burning chamber, the burners being flame jets. The calcined product is removed from the bottom of the chamber by a screw running in the center. A mechanical distributor (1, 80) for limestone to shaft kilns was also patented.

A new laboratory testing manual (8, 67) was brought out by the National Lime Association, the A. S. T. M. tentative specifications (19, 76) for lime published, and a complete analysis of 37 chemical limes for quality specification purpose made by the Bureau of Standards (1, 61). The bureau is studying further the "rate of absorption" requirements of the plasticimeter (4, 74), thermal methods of hydrate analysis (4, 93), and influences effecting plaster drying (8, 51). The shortcomings of our system of classifying limes is best brought out by comparison with the British system (21, 53), which lists many different types including the puzzuolanic limes.

Gypsum Research

Though the United States is the largest manufacturer of gypsum products in the world, it must turn to other countries for much of the research, or at least the published research. Chassevent has developed a calorimetric method (21, 89) for rapid plaster analysis and also conducted a study on setting properties using a combination of electrical conductivity and thermal analysis (6, 82). Budnikoff classifies the catalyzers (4, 81) converting anhydrite to gypsum as follows: Acid salts, basic salts and neutral salts, the efficiency decreasing in the order stated. His reaction is: Anhydrite + catalyzer + H_2O = unstable hydrate which breaks down to $CaSO_4 \cdot 2H_2O$ (gypsum), the catalyzer separating out. Set gypsum can be reused by adding small amounts of Al_2O_3 and recalcining, Farnsworth's study reveals (16, 69). Small amounts of limestone and alum admixed with gypsum (17, 78) form the basis of a new acoustical plaster developed at the Bureau of Standards. Gypsum plaster from limestone (18, 97) is proposed by one patent, the limestone being partially calcined to lime and fed hot to a concentrated solution of sulphuric acid, the concentration being regulated so that the heat evolved in the reaction will partially expel the water. The resulting mixture of lime, limestone and plaster of paris is ground in a ball mill.

Cellular Gypsum

Some of the patents actually in use at several plants were granted this year. One involves an admixture of aluminum sulphate, starch, granular sodium bicarbonate and soap bark (7, 81) and another aluminum sulphate, limestone, soap and gum arabic (20, 97). Calcium caseinate (18, 97) is suggested as an ingredient of one formula for cellular gypsum, and still another method forces gaseous CO_2 (8, 93) into the gaged plaster. The CO_2 gas is liberated by acid treatment (13, 84) of the limestone admixture in another invention and the porous mass cast and faced with concrete.

New ideas for wall board manufacture, many of them pertaining to the edge construction, were included in the patent literature. The Routt patents and plant operations for "Locklath" (23, 58), were described in detail. Canadian patents were issued Haggerty (13, 84) for gypsum mixtures, the chief features of which are the use of a beaten fibre-liquid mixture for gaging the plaster.

Two important investigations have been completed by the Bureau of Standards, one on the elasticity and rupture moduli of various gypsum mixes (1, 36) and the other on control of expansion of calcined gypsum. The investigators found increased amounts of mixing water, finer ground gypsum, coarser sand mix and certain admixtures were among the factors through which expansion could be decreased.

Magnesia and Magnesia Cements

The use of magnesia cements is bound to increase in the future, the only bar at present being the lack of knowledge of their properties. A recent study now con-

siders the formula of magnesia oxychloride cement to be $3MgO \cdot MgCl_2 \cdot 10H_2O$, the final reaction in setting probably resulting in a solid solution in which MgCl, MgO and $Mg(OH)_2$ exist in addition to the oxychloride crystals. Another investigator says a microscopic examination shows the setting to be caused by the action of the chloride solution on the oxide grains, the grains swelling through some change in their interior until coherence ensues (**11**, 90). Hardness of the cement varies with the grain size of the magnesia and the salt solution used—chloride, bromide, sulphate or nitrate solutions giving less hard cement in the order named. Addition of colloidal silica (**8**, 93) to Sorel mortar increases the strength of the cement by one-third, according to Luftschitz. One inventor claims non-deteriorating features for a cement made of a mixture of ground anhydrous ferrous chloride, magnesium oxide and filler (**21**, 89). A zoned rotary calcining kiln (**14**, 97) from which the products are withdrawn from the zones has been patented. Refractory magnesia products (**1**, 79) made in various manner have been invented.

Rock Phosphate

The investigations on rock phosphate are practically all aimed at producing valuable by-products in conjunction to getting the phosphorous content in an available form. An electric furnace process (**14**, 97) fuses the rock phosphate with silica and coke, the phosphorus being volatized and collected. To the residue, aluminous material is added in the right proportions to make a hydraulic cement. Another inventor uses a blast furnace charged with the rock, silica, coke and alkali chloride (**1**, 80). Treatment with aqueous solutions of SO_2 and high pressures (**1**, 80) is proposed in a patent. Several other inventions deal with production of a gypsum by-product (**18**, 97; **17**, 82; **9**, 76).

Potash and Feldspar

The future of the potash industry in this country seems to lie in the development of the brine wells in Texas, New Mexico and other places. Nevertheless the potash bearing minerals have been under rigid investigation for some time and only recently Fox and Whittaker described a method for utilizing the green sands. The principal potash salt in this country is potassium chloride, which has only a fair market value. Fox and Whittaker have devised a method by which the KCl is converted to the more valuable K_2SO_4 and the by-product hydrochloric acid utilized in phosphate treatment (**8**, 67). The dicalcium phosphate so made has 40% available P_2O_5 against 16% from the usual method of manufacture, is non-hygroscopic and does not undergo reversion on standing. Jourdan uses rock leucite (**16**, 75) with lime in a kettle process to produce potash and potash salts.

The Bureau of Standards has conducted several studies on the use of feldspar in ceramics. It was found that variation in composition and fineness of grind of the feldspar do not affect porosity, translucence and shrinkage of white ware (**4**, 77). Other investigations on the effect of different feldspars on relative glaze fits, thermal expansion, etc., are under way (**18**, 70). Two scientists have recently developed a microscopic qualitative and quantitative determination (**21**, 52) of the minerals composing feldspar.

Sand-Lime Brick

No concerted efforts anywhere on the chemistry of the sand-lime hardening process. An important point was settled by the A. S. T. M. definition of a brick (**14**, 71) which left no room for argument with clay brick. The Federal master specifications call for three classes of sand-lime brick, hard, medium and soft. The standard size is given as 2¼x3¾x8-in. Germany adopted specifications early in the year (**6**, 69). The Bureau of Standards is now conducting tests (**23**, 66) on bond strength between mortar and sand-lime brick and also shear tests to find the effect of thickness.

Slate, Mica, Fluorspar

Most of the work done the past year on slate was on the use of the wire saw, a comprehensive report by Bowles (**17**, 55) listing its advantages as follows: Lower first and operating costs, reduction of further cuts in mill stock, elimination of shattering, etc. It has been proposed to use ground slate as a filler, and one patent grinds slate and lime in a colloid mill to which water and glue are added. The mass is centrifuged, pressed and steamed in a CO_2 atmosphere to make an artificial blackboard or other slate product (**23**, 78).

Myers of the Bureau of Mines brought out an excellent treatise (**19**, 57) covering the mica industry from mining to marketing.

In addition to Becker's article on fluorspar in cement manufacture, there were several other studies conducted on its use in the steel industry. According to a German report (**8**, 71) cupola practice in that country shows additions of fluorspar to high grade limestone for desulphurizing the charge to be of no value; the cupola slag is more viscid with fluorspar than when pure limestone is used alone and fluorspar cannot of itself completely desulphurize the product. All of which is interesting and somewhat in contrast to what was general opinion about the use of fluorspar as a fluxing agent.

Aggregates

The work on aggregates has been largely covered in the reports from the engineering bureaus of the National Crushed Stone Association and the National Sand and Gravel Association. The Bureau of Standards is testing the durability of aggregates (**19**, 50) and the resistance of stone to frost (**18**, 120) and the American Society for Testing Materials, Committee D-18, stone has recommended some very important changes (**14**, 74.) An Illinois Geological Survey bulletin lists the qualities of good limestone for sewage filter beds (**7**, 53) and Bowles has prepared a comprehensive review of the requirements for metallurgical limestone (**14**, 100) and the operation methods for its production. Miller has determined the percentages of various sizes of stone produced in jaw and gyratory crushers (**6**, 56; **8**, 62; **10**, 60; **12**, 85; **14**, 76 and **16**, 72.)

Loughlin throws some light on the dangers of using some argillaceous limestones (**14**, 73) which although passing regular tests go to pieces on weathering. The cause of disintegration can be determined by a petrographic study which reveals the mineral beidellite as present. A visual analysis of sand by means of photomicrographic (**13**, 50) is suggested by McKay as an efficient way of indicating quantity, uniformity and grain sizes of sand. The Nicholson theory of stability of asphalt mixtures (**5**, 46) is important, as it may develop a new use for crushed granite, limestone, slag and gravel. The Brinell test for hardness of metals is proposed by Marcotte (**15**, 88) to determine hardness of stone, plaster, etc. Chapman has devised a special flask (**14**, 84) for determination of voids, specific gravity and moisture in sand. Serious volume losses and strength deviations are caused by sand deficiency error through neglecting the bulking of sand (**19**, 72), Goldbeck points out. Improved equipment for crushed stone, slag and sand and gravel production was discussed at length in the December 24, 1927, issue.

Treatment of Aggregate

The sodium silicate treatment of hardening roads is not common in the United States but in Europe has been used with success. The preferable rocks for treatment are the open-grained capable of adsorbing the material (**23**, 97). Other factors influencing hardening are drying and the CO_2 from the air. Aggregates may be toughened by mixing a little dry lime (**24**, 99) with them to remove entrained water, etc. A patent has been granted on a process of making colored aggregate (**18**, 97) by treating the wet stone with a silicate solution of an insoluble pigment and final roasting to fix the color. One inventor proposes to mix red mud (a by-product of alumina manufacture) to molten slag in the ladle (**8**, 93), thus making an artificial aggregate. A lightweight aggregate results from sintering clay or clayey material to a point just before the expanded mass sinks, according to a recent patent (**17**, 82). The mass is then cooled and ground and used as the usual concrete aggregate.

Concrete

Increased use of concrete for different purposes led to many special investigations to co-ordinate existing information as well as search out new data. Effects of weather on block curing (7, 79), effects of $CaCl_2$ on set and strength (4, 80), causes of stucco failure (15, 95) protection of concrete against alkali (23, 95) and sea water (22, 89), a study of static and impact strains on culverts and methods of avoiding capillary cracks (3, 83) are a few of the studies of interest to products men. The Bureau of Standards has devised a new method of studying workability (1, 61). Goldbeck in a N. C. S. A. bulletin (15, 92) pointed out that specifications based on water-cement ratio are insufficient, several other factors having considerable influence on concrete. He suggests preliminary tests with the materials as an adjunct to others. Definite and constant relationship between concrete materials (5, 45) is maintained if proportioning by weight is adopted. Tensile and flexural strength were found to be of greater significance than compressive strengths in determining the value of a concrete for pavement (21, 80).

Porous Concrete

Special concrete mixes designed for lightweight material were covered by patents here and abroad. Foam producers were generally employed, one British patent using colloidal solutions of glue and gelatin (8, 92). Another patent introduced an admixture of lime, shale and aluminum or zinc chips (1, 79), the hardening of the porous mass being accelerated by steam under pressure. Platzmann found aluminum to be an efficient gas producing medium and another investigator decided that calcium-magnesium alloys could be used with success for the same purpose. A recent decision in the United States District Court (New Jersey) throws considerable doubt into the validity of the Straub cinder-concrete block patents (25, 85). This decision is particularly valuable for research purposes, as it includes a complete history of the art, from patent office records and current technical literature. A fibered concrete (1, 79), the Berliner special acoustic concrete which is spread on hollow wire discs or cells (14, 54) and a concrete capable of being pressed into desired shape (1, 80) were listed among the new patents.

Suitable colors for concrete and their tests were discussed by Platzmann (18, 107) and Wilson. Certain inorganic vat dyes (20, 97) added to the gaging water are suggested in an English patent. Two of a number of patents for concrete glazes appear to have commercial possibilities, one using a flux-color mix (20, 97) and vitrefying furnace and the other a mixture of cement, color and water ground fine to a glossy lustre (17, 83), the mix being brushed or pressed on as a thin layer over the concrete surface.

Produce Phosphate Fertilizer at Lower Cost

A NEW method of manufacture of ammonium phosphate, highest in plant food of all fertilizers, is expected to put American producers in a position to undersell the similar German product by $35 a ton, according to the *Manufacturers Record*. This process was devised by Stewart J. Lloyd, professor of chemical engineering at the University of Alabama, and A. M. Kennedy, research engineer of the Alabama Power Co., according to the announcement. Commercial production by the Chemical Products Co. of Birmingham, a subsidiary of the Southeastern Power and Light Co., New York, will start on a small scale at Birmingham shortly, it is stated.

The process in abstract follows:

"1. Crushed phosphate rock is digested with a strong solution of ammonium bisulphate. The result of this reaction is a solution containing ammonium sulphate and phosphoric acid, together with a precipitate containing calcium sulphate. These are separated by filtration or by counter current decantation.

$$Ca_3(PO_4)_2+6NH_4HSO_4\rightarrow 3(NH_4)_2SO_4+2H_3PO_4+3CaSO_4$$

"2. To the filtrate is added an excess of ammonia when triammonium phosphate is precipitated, leaving ammoniuum sulpate in solution. These are separated.

$$3(NH_4)_2SO_4+2H_3PO_4+6NH_3\rightarrow 2(NH_4)_3PO_4+3(NH_4)_2SO_4$$

"3. The precipitate is heated in a dryer when it decomposes into diammonium phosphate, which is pulverized to commercial form, and ammonia which is collected.

$$2(NH_4)_3PO_4\rightarrow 2(NH_4)_2HPO_4+2NH_3$$

"4. The precipitate form (1) is digested with ammonia and carbon dioxide gas. The result is a precipitate of calcium carbonate and a solution of ammonium sulphate. These are separated.

$$3CaSO_4+6NH_3+3CO_2+3H_2O\rightarrow 3CaCO_3+3(NH_4)_2SO_4$$

"5. The ammonimum sulphate from 2 and 4 is crystallized and the crystals heated to about 300 deg. C., when ammonia gas is given off and ammonium bisulphate reformed. The latter, at this temperature, is quite fluid and is ready for re-use in step 1.

$$3(NH_4)_2SO_4+3(NH_4)_2SO_4\rightarrow 6(NH_4)HSO_4+6NH_3$$

"The expendable materials in this process are phosphate rock, ammonia and carbon dioxide gas. The latter is a by-product in the production of synthetic ammonia. The only by-product of this process is calcium carbonate, which, containing also silica and alumina from the original rock, is probably in excellent physical shape for the economical production of portland cement. The laboratory product of this process from Tennessee phosphate rock is a cream colored material which can be easily pulverized and readily put into a form best adapted for distribution by mechanical fertilizer spreaders. Samples were exposed to the atmosphere in open dishes during the late winter and wet early spring of 1927 and did not become moist, cake or in any manner change from the original pulverent form. This material contains approximately 23% NH_3 and 47% P_2O_5. A mixture of 100 lb. of this with 48 lb. of commercial potassium sulphate would produce a 15.5-32-15.5 mixed fertilizer containing 63% of plant food, or about four times that of the usual 4-8-4 mixture, which could be made by the addition to 100 lb. of the high-grade mixture of about 280 lb. of 'filler' or sand."

Comparative estimated costs of production of diammonium phosphate by the two methods which have been used in this country and by the ammonium bisulphate process for a plant utilizing 10,000 tons of fixed nitrogen per year indicate that the relative costs per ton of ammonium phosphate are:

Sulphuric acid process, $53; electrothermal process, $51.11, and ammonium phosphate process, $34.50.

Slag, Coke Breeze and Clinker as Aggregates

A NEW bulletin with the above title has been published by the Department of Scientific and Industrial Research, London, England, as a preliminary report of the research work at the Buikding Research Station. This report contains existing information, collected and arranged in a form which is useful to producers of crushed slag and cement products manufacturers who use either slag or clinker as aggregates. No attempt has been made to draw up specifications nor are the conclusions definite but the general account given contains data on the present knowledge of slags, clinker, etc., and indicates the troubles to be avoided in their use as aggregate.

These materials will make suitable concrete provided due regard is paid to the nature of the concrete desired and the particular purpose for which it is employed, the bulletin states. In all cases, careful selection of material is stressed. The slag should be neither very acid nor basic and it is often best to use only the coarse pieces, rejecting the fines to obviate possible activity.

Coke breeze with sand as fine aggregate can be used to make a light concrete for internal wall construction, provided selection of the breeze is made with care. Clinker yields a denser and stronger concrete than coke breeze but may give trouble owing to its lack of uniformity and the presence of unburned coal. Clinker used with lime makes a serviceable aggregate for mortar or plaster, its puzzolonic properties giving such mortars greater strength. The variable properties of clinker present difficulties.

The effects of sulphur in these materials has been studied and no definite conclusions drawn. In general, the bulletin states, if the sulphide content of the slag is not above 1.5 to 2% and the slag compact and otherwise suitable, no deleterious effects of slag concrete are to be anticipated. Clinkers containing not more than 1% of calcium sulphate and a smaller percentage of sulphate are satisfactory when otherwise suitable.

This bulletin is called Special Report No. 10 and is available on application to His Majesty's Stationery Office, 16 Old Queen St., Westminster, S. W. 1, London, England, at a price of 9d. (about 18 cents).

W. Scott Eames

ON JANUARY 18, at the West Baden, Ind., convention of the National Crushed Stone Association, W. Scott Eames, as chairman of the nominating committee, was very much alive, and very much in earnest in his untiring work for the welfare of the crushed stone industry. On January 25, just one week later, he died at his winter home in Florida, where he had gone for a well-earned rest. His funeral was held at the First Methodist Church, New Haven, Conn., on January 28, attended by many of his friends and co-workers in the industry.

In his death the National Crushed Stone Association has lost one of its staunchest friends and supporters, and a great many individuals who worked with him in building up the association have lost a very loyal, sympathetic and earnest friend. He was a director of the National Crushed Stone Association, almost from its beginning. It was at a Baltimore meeting of the directors of the association, early in 1918, during the strenuous period of the war, that Scott Eames first took an active part in the councils of the industry. Since then we believe he never missed a meeting of the directors. At the Chicago convention in 1922 he was elected president; and it was during his administration that the manufacturers' division of the National Crushed Stone Association was organized and the first exhibit held.

W. Scott Eames was a graduate of Yale University and was active in many local organizations, as well as in the national association of his industry. For many years he had been general manager of the New Haven Trap Rock Co., the largest, one of the earliest, and one of the most successful commercial crushed-stone operations in the United States. In addition he was active in other enterprises controlled by the Blakeslee interests, including the New Haven and Shore Line Railway Co. (electric), of which he was president. Last September Mr. Eames was chosen president of the Connecticut Bond and Mortgage Corp., in addition to his many other responsibilities. He was also associated with B. B. Savage in the B. B. Savage Co., and was interested with Mr. Savage in the New Haven Upholstery Co.

Scott Eames' early business experience was selling furniture to dealers. At the recent convention of the National Crushed Stone Association, in an informal talk to the salesmen's group session, he gave a few intimate glimpses of his early experiences as a furniture salesman, while emphasizing the necessity of personality in selling. His talk was of a fatherly and brotherly nature and was intended, as it did do, to emphasize the value of absolute integrity and cheerful optimism in all one's dealings. He, himself, was indeed the personification of these and many other manly virtues.

W. Scott Eames

Canadian Asphalt Sand Deposits To Be Developed

AT Fort McMurray in northern Alberta, 310 miles from Edmonton by railroad and a five-mile haul on the Athabaska river after leaving the railroad, are extensive deposits of asphaltic sands, said by the department of mines at Ottawa to contain billions of tons. Thus far, 270 outcrops have been found over a distance of 220 miles as practically one continuous deposit.

During the past year an experiment has been made with these sands for road surfacing in Jasper Park, Alberta, where a section of highway 2¾ miles in length between the railway station and the Jasper Park Lodge has been covered. According to the Canadian government engineers, the experiment has demonstrated definitely that the Alberta product can be used in commercial competition with other highway surfacing materials.

In connection with the operations in Jasper Park a small plant was installed for preparing the sands for application to the roads. The material was mixed with a local aggregate and dumped into two revolving drums 6 ft. in diameter which were internally heated by an oil burner to a temperature of 325 deg. Fahr. The treated material was then applied to the road and rolled by a 7-ton roller. It is stated that the surface was ready for traffic three hours after being compacted.

The final cost of the surfacing at Jasper was $1.04 per sq. yd., as compared with $1.23 per sq. yd. for similar work with imported materials in Edmonton, the nearest city. The engineers claim that with the installation of labor-saving devices and improved equipment at Fort McMurray, and with minor alterations to the heating and mixing plant, the cost can be reduced by 25%, bringing it down to 78 cents per sq. yd. It is claimed that the extension of the Alberta and Great Waterways railway direct to the quarry at Fort McMurray will reduce the cost of the finished paving to 55 cents per sq. yd.

According to the Alberta trade commissioner, a California syndicate has formed the Altapave Mannfacturing Co., secured holdings in the bituminous sands area, and is prepared to spend $200,000 in development as soon as the railway is extended for a distance of 3½ miles. The same company is said to be planning a large plant at Edmonton for treating the raw material.—*Commerce Reports* (Canada).

Texas Mineral Production in 1927

MINERALS and mineral products obtained in Texas in 1927 had a total estimated value slightly in excess of $325,000,000, as compared with a total value of approximately $375,000,000 for 1926, according to Dr. E. H. Sellards, director of the Bureau of Economic Geology of the University of Texas. In the absence of complete figures for 1927, the different products are not classified as to value. Among the leading minerals and mineral products are asphalt rock, cement, fuller's earth, granite, gypsum, lime and limestone, petroleum, sand and gravel, sandstone, basalt rock and graphite.

Proceedings of Conference on Highway Engineering

THE proceedings of the thirteenth annual conference on Highway Engineering have recently been issued. The conference was at the University of Michigan, at Ann Arbor, in February of last year, and the university completed the publishing of the volume of proceedings. The discussion of the conference centered mostly on construction of concrete roads and the building and maintenance of gravel roads. Of particular interest are the papers on "Concrete Road Construction and Maintenance," by A. N. Johnson, dean of the College of Engineering, University of Maryland; "Materials Control," by R. L. Morrison, director of the Michigan State Highway Laboratory, and "Investigation of Abrasion Tests of Road Gravel," by B. T. Schad, professor of civil engineering at the University of Dayton.

Experiments on the Production of Standard Samples of Cement*

By M. Rengade
Director, Laboratory, Lafarge & Teil Lime and Cement Co.

INASMUCH as every method is liable to error and every apparatus and method of determination is liable to go wrong at some particular moment, hence it is indispensable when necessary to record accurate results to be able to standardize them at any moment. It is on this plan that hydraulic presses are standardized at the present time. The use of such standardization apparatus is all the more valuable, the more the methods of testing in which they are applied are susceptible to errors or variations under differing conditions.

A number of years ago the idea was conceived of producing standard or type specimens for use in checking industrial chemical analyses, especially in the field of steel analysis. Sample of homogeneous steel filings of differing types and compositions were produced, each lot of filings being analyzed with the greatest care by a certain number of laboratories specializing in this work. The average was taken as the exact figures for the sample and when a particular laboratory wishes to assure itself that its analytical methods are correct, all that is necessary is simply to procure one of these standard specimens which approaches the nearest in composition to the steel regularly analyzed. If the figures then obtained differ from those given the working method will have to be modified until the correct figures are obtained. Similarly, in case of a disagreement between two analysts or between seller and buyer, the use of standard specimens by the two parties will solve any difficulties.

Standard or type specimens of this description were first produced in the United States and then in England, and in 1922 in France.

Standard Samples Useful

It is apparent that similar samples of cements would be still more useful, not only for chemical analyses, but also as a means for standardization of mechanical strength tests. It is known that these determinations are greatly subject to the slightest variations in the gaging of the mortar, the making of the sample briquettes or the conditions under which they are kept, it being rare to find two laboratories producing results in close agreement. An inquiry instituted 25 years ago by M. Mesnager in which seven different specialized laboratories were represented brought results showing variations running to 40%. There is no reason for believing that any great progress has been achieved since. And yet only laboratories of the first order were involved. Cements, unfortunately, have been quite often tested under very defective conditions and by laboratories with inadequately trained workers and insufficient supervision.

Such laboratories can send specimens to the large official laboratories for check results, but this is done at rare and infrequent intervals. Moreover, under this procedure, in case of disputed results, it is often necessary to wait a long time for the check figures, the large laboratories being often overrun with work. With possession of standard specimens it becomes a simple matter for every laboratory to check up its work at regular intervals or every time that there may be a reason for suspicion in case of any working method in use.

But here arises a question of prime importance: Is it possible to produce standard or type specimens of such a character, that is to say, of a constant and continuous identity no matter how long they be kept? It is known that the properties of cements are generally subject to change in course of time and often do so quite rapidly. These changes are especially notable in regard to the rapidity of setting and the expansion in the Le Chatelier cylinder, but they evidently also undergo alterations in strength.

Variations Undergone by Cement

These variations may be considered as being due to two causes:

1. Exterior action of air, humidity and carbon dioxide, from which result a gradual air slaking of the cement. It is apparent that this change can be prevented by keeping the cement out of contact with the air in a tightly closed container.

2. Internal changes resulting in a progressive change in the cement itself. This can be traced to two general causes:

(a) Heterogeneity of the original specimen, i.e., particles incompletely slaked and particles containing a small excess of moisture. The former, containing anhydrous lime, absorb water little by little from the latter, due to the low dissociation tension of the calcium silicates or aluminates. An increase in volume takes place gradually. This is the well known mechanism of the process of disintegration by the action of time.

(b) A slow transformation of the sample from whatever cause, in part at least, into an unstable moist modification due to insufficient passive resistance with gradual retrogression into a stable state (spontaneous reburning, well known in the case of certain alloys).

The existence of the phenomenon *a* is certain, that of the phenomenon *b* is purely hypothetical in the case of cements, and is accepted only through analogy.

In every case it is possible to arrive at a state of equilibrium of a definite nature by means of a cure of an ample length of time. This interval can be shortened considerably when stabilization *a* or *b* is kept in view by the action concomitantly of a temperature not too high, for example, from 150 deg. to 200 deg. C.

In order to obtain some confirmation of these conjectures in practice, the following tests have been carried out, using a double burnt artificial Lafarge cement:

A 100-kilo sample was subjected to careful mixing by tumbling in a laboratory ball mill from which the balls had been removed. The cement was divided into two kegs which were sealed and placed in the chamber of a pulverized coal dryer in the Lafarge factory, prevailing temperatures remaining constantly between 150 and 200 deg. C.

After 15 days of heating, the kegs were taken out and rolled to and fro for a quarter of an hour without being opened, after which they were put back, this being done to effect a new mixing of their content.

Finally, after a month of heating they were taken out and allowed to cool. The contents were run once more through a

PHYSICAL TESTS ON STANDARD CEMENT SPECIMENS

Date of Mixing	Water added per cent	Setting Time		Tensile Strength, Kg./cm.²			
				Neat	1:3 Mortar		
		Start	Finish	7d.	2d.	7d.	28d.
Oct. 17, 1924	35	5.10	10.30	32.5	8.4	24	33.1
Nov. 18, 1924	35	6.50	13.56	32.1	6.9	22.5	33.3
Jan. 20, 1925	35	6.10	13.04	31.6	9.6	22.3	30.7
Feb. 16, 1925	35	5.29	10.35	33.2	10.9	22.0	31.0
Mar. 12, 1925	35	6.29	12.55	37.2	10.4	24.1	34.1
June 3, 1925	35	4.29	10.57	33.1	12.3	25.5	37.1
July 4, 1925	35	5.04	12.07	34.3	11.1	24.0	32.8
Oct. 30, 1925	35.4	4.35	10.43	33.6	13.4	27.1	30.9
Feb. 16, 1926	35	6.20	13.20	34.1	10.9	23.0	29.9

*Translated from *Le Ciment*, October, 1927.

laboratory ball mill minus the balls in order to bring about a perfect homogeneity and then divided up immediately in tin cans of 2 liters which were soldered up.

Using this material, standard tests were run after different intervals of time on 8 briquettes; a test of 7 days with neat cement and three tests with 1-3 plastic mortar of 2, 7 and 28 days respectively. Each trial was of course carried out with the 6 regular briquettes. The table given shows the results obtained:

The strength test of mortar of 2 and 7 days are in general the average of the results of four individuals working simultaneously. The tests on the neat cement and the 28-day mortar were carried out by one individual only.

These results which extend over a period of 16 months show considerable variations, but considerably less than frequently met with in the different laboratories. It is to be noted that the figures obtained with neat cement are, with one exception, quite satisfactory with regard to constancy. The results with mortar, especially the 2-day tests show noticeable variations.

These variations do not appear to be in accordance with any systematic law. Whether they are due to a change in the samples, or to a difference of working conditions (personal factor of the worker, temperature of the working rooms, the measuring apparatus), etc., it is difficult to say. The latter supposition appears to be at least as probable as the first, especially when the regularity in the case of the neat cement is taken into consideration.

In order to know what to depend on with certainty, it would suffice, it seems, to repeat these trials in different laboratories, among which the sample cans prepared in advance have been distributed. These trials would have to be carried out at the same time and at fixed intervals, and the results obtained compared in such a manner as to eliminate experimental variations properly so-called and bring into evidence, according to the case, the progressive change in, or the stability of the specimens. It is well understood that there would be no pretension to such a thing as absolute stability, as there does not exist at the present any method of exact testing. The use of such standard specmiens will no doubt prove interesting, although the results so far obtained may not be considered conclusive.

Steel and Cement Consumption

(An Editorial in "Iron Age," January 26, 1928)

THAT the production of portland cement has increased much more in the past 15 years than the production of steel is a fact that presumably is generally recognized. Any inference that the gain has been at the expense of steel is erroneous. In a general way it may be said that construction work has come to represent a larger proportion of our total industrial activity than formerly. Since 1913 there has been substantially the same increase in ton-mileage of freight movement as in the total production of steel, but both the quantity of structural steel fabricated and the quantity of portland cement manufactured have increased in much greater ratio. They have approximately doubled since 1913, while the gains in freight movement and total steel production have been less than 50%. The increase in construction work has swelled the output of structural steel and cement alike.

When cement is thought of as a competitor of steel, fabricated structural steel is particularly in mind. It is acknowledged that the use of other forms of steel is stimulated by the increasing employment of cement. A direct comparison of the consumption of fabricated structural steel and portland cement is therefore strictly in point and reasonably conclusive. Such a comparison is made below for the 15 years beginning with 1913. The first column of the table shows lettings in net tons of fabricated structural steel through 1923 and the shipments of the fabricating shops in subsequent years, compilation of statistics of shipments having begun only with 1924. The second column shows the shipments, in barrels, of portland cement. The third column gives for each year the number of barrels of cement per ton of fabricated structural steel. The index for 1913 was 70.3, and none so high was shown afterward except for the off-year 1921, when cement droped only a trifle, while steel dropped a great deal.

PRODUCTION OF STEEL AND PORTLAND CEMENT, 1913 TO 1927, INCLUSIVE

	Fabricated Structural Steel Net Tons	Portland Cement Shipments Barrels	Barrels Cement to 1 Ton Steel
1913	1,260,000	88,689,377	70.3
1914	1,266,000	86,437,956	68.2
1915	1,797,600	86,981,681	48.2
1916	1,838,160	94,552,296	51.5
1917	1,663,200	90,703,474	54.5
1918	1,639,680	70,915,508	43.2
1919	1,602,720	85,612,899	53.5
1920	1,684,800	96,311,719	57.1
1921	1,113,000	95,507,147	85.6
1922	2,112,960	117,701,216	55.7
1923	2,188,800	135,912,118	62.0
1924	*2,411,390	146,047,549	60.5
1925	*2,796,090	157,295,212	56.2
1926	*2,842,920	162,187,090	57.1
1927	*2,626,680	170,922,000	65.0

*Shipments; figures for previous years are for lettings.

It may be mentioned as a detail that consumption of cement increased slightly more than is indicated by the record of shipments, by reason of increased imports and decreased exports, but the difference is not sufficient to alter the fact that in recent years fabricated structural steel has had a higher ratio to cement than in 1913 and 1914.

The foregoing comparison, while favorable to steel, does not tell the whole story. The use of cement in road building and on the farm has greatly increased, these two classes accounting for nearly, if not quite, one-half the total cement consumption. Cement thus used does not take the place of structural steel, but does stimulate the use of other forms of steel.

Duty on Magnesite Does Not Equalize Foreign Cost of Production

THE United States Tariff Commission recently made public its findings in the cost-of-production investigation covering magnesite. President Coolidge, upon receiving the findings, ordered an increase in duties on imported magnesite in accordance with the recommendation of the commission.

The commission found that for crude magnesite the principal competing country was Greece, and the difference in the cost of production in the United States and the cost of production of similar crude magnesite in Greece, including transportation to New York, is $11.10 per short ton, or $0.00555 per pound. The present duty of five-sixteenths of a cent per pound ($6.25 per short ton) does not equalize this difference in the cost of production, and it would be necessary to impose a specific duty of 15 thirty-seconds of a cent per pound (equivalent to $9.375 per short ton) to equalize this.

For caustic calcined magnesite, the commission found that the principal competing country is British India. The imports from this country are in the lump form, which is the form in which magnesite is imported in greater quantities than in any other form. A comparison of the cost of production of domestic caustic calcined lump magnesite and a like imported product shows that the domestic product exceeds in cost of production the imported product, when the cost of transportation to New York is included, by $19.68 per short ton or $0.00984 per pound. The present duty of five-eighths of a cent per pound ($12.50 per short ton) does not equalize this difference in the cost of production, and it would be necessary to impose a duty of $0.009375 per pound (equivalent to $18.75 per short ton) to equalize this difference in the cost of production of caustic calcined magnesite.

Geological Society Shows Value of Geologist's Work in Locating Gravel Deposits

AT the annual meeting of the Geological Society of America, held at the Case School of Applied Science, Cleveland, on December 31, 1927, it was pointed out that the geologists of the various states can be very useful to the highway departments and also to producers of rock products generally. E. F. Bean, state geologist for Wisconsin, told the society that his state is now saving thousands of dollars annually in the cost of road building by finding deposits of sand and gravel close to the construction project.

"When a new gravel or concrete highway is proposed in Wisconsin," Mr. Bean said, "the highway department calls upon the state geologist to find supplies of gravel close at at hand. The long haul for gravel and crushed stone has been eliminated. On some of the roads the saving has amounted to as much as $5,000 a mile."

Composition of Commercial Chemical Limes*

Data Developed for Preparing Specifications for Chemical Lime

By J. S. Rogers
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THE data herein reported were developed for the purpose of preparing specifications for chemical lime. The preparation of these data was undertaken at the request of the Interdepartmental Conference on Chemical Lime, which is composed of representatives of the various governmental establishments interested in lime and its application. The conference, through the Bureau of Standards, and in co-operation with the industries interested, prepares and issues recommended specifications for lime suitable for use in the various chemical industries. Recently it became necessary, in the preparation of specifications, to determine the composition of representative chemical limes and this study included those constituents present in small amounts.

Generally each industrial process using lime requires a product of definite composition for optimum reactions. For example, iron[3] has a detrimental effect in bleaching powder in that it accelerates decomposition; manganese[4] has a similar effect; insoluble matter retards slaking of quicklime, abrades processing machinery, etc.; arsenic compounds are obviously objectionable in lime used in products destined for human consumption; and phosphorus is undesirable in lime in the steel industry. Each industry has therefore found it advantageous to set limits on the constituents of the lime used.

For use in the investigation, 35 samples of lime—16 hydrated limes and 19 quicklimes—representative of those used in chemical industries were furnished by producers for analysis.

Methods Used

The A. S. T. M.[5] methods were used as a guide in the analyses of the lime samples, but where desirable and where circumstances warranted other methods and modifications of the A. S. T. M. procedure were employed as follows:

The *silica* was dehydrated only once, as data obtained on several samples showed that the second dehydration was unnecessary because of the low silica content of all the samples.

Iron was determined in two ways—first, by the dichromate method with noted modifications, and second, colorimetrically. The first method required the reduction of the hot hydrochloric acid solution of the sample with stannous chloride, followed by the addition of mercuric chloride to the cooled solution, and finally titrating with dichromate, using diphenylamine as an inside indicator.[6] In the second method the "R_2O_3" was precipitated by Blum's method,[7] dissolved in dilute hydrochloric acid and fumed with concentrated sulfuric acid to convert the iron, aluminum hydrates, etc., to sulfates. The sample was then diluted to a known volume and an aliquot portion transferred to a Nessler tube. A standard sample of ferrous sulfate was likewise prepared in a Nessler tube and potassium permanganate added dropwise to each tube until the pink color of both tubes was of the same intensity. Ammonium thicyanate was then added, the solutions diluted to equal volumes and the color intensity compared in a Duboscq colorimeter.[8]

Alumina was determined by subtracting the sum of the oxides of iron, phosphorus and manganese from the R_2O_3 value, and therefore includes any titanium oxide that might be present.

Both volumetric and gravimetric methods were used in determining *phosphorus*. The first method consisted briefly in dissolving in standard alkali, the ammonium phosphomolybdate, precipitated from a nitric acid solution of the sample, and titrating the excess alkali with standard acid—viz., nitric acid. The second procedure called for the precipitation of phosphorus as $MgNH_4PO_4 \cdot 6H_2O$ with subsequent ignition to $Mg_2P_2O_7$, from which weight the phosphorus content was determined.[9]

The bismuthate method was used for *manganese*, following the conventional method used in steel analysis to determine this element.[10]

No *arsenic* was detected in any of the samples by the Gutzeit method.

Calcium was precipitated once as oxalate and titrated with potassium permanganate solution.[8]

Magnesia was determined in accordance with the procedure given by the Bureau of Standards[11] using microcosmic salt as the precipitant and igniting the resulting $MgNH_4PO_4 \cdot 6H_2O$ to the pyrophosphate.

The *sulfur* (SO_3) was precipitated as barium sulfate by adding barium chloride to a 2% hydrochloric acid solution of the sample.[3]

The *carbon dioxide* evolved by dissolving the sample in hydrochloric acid was absorbed in ascarite.[12]

The *loss on ignition* equaled the net change obtained by blasting a weighted portion of the sample to constant weight.

The *solubility in 1:9 hydrochloric acid* was determined by digesting the sample on the steam bath with acid of that concentration for half an hour.

It was noticeable that several of the quicklime samples exhibited a strong tendency to hydrate and carbonate during the exposure to the atmosphere in the necessary handling of the sample. The irregular absorption prevented duplication of results, especially when a considerable period elapsed between analyses. By placing the ground quicklime in a closed desiccator over water, the quicklime hydrated, reaching a state of chemical stability where its composition remained constant during the time necessary for analysis. (By this method a small amount of carbon dioxide was left in the desiccator, but this amount was negligible.) This procedure was not necessary in the cases of slow hydrating quicklimes.

For the convenience of the reader, the CaO figure on the quicklimes, which were hydrated before analysis, can be calculated to what it would have been in the original lime, assuming a 1% loss on ignition. A 1% loss may be assumed without serious error, as this is approximately the average ignition loss. The following formula indicates a method of calculating the CaO from the hydrated sample:

$$\text{CaO} = \frac{\text{CaO in hydrated sample}}{100 \div (\text{per cent loss} \div 1)}$$

Discussion of Results

The results are shown in the accompanying table.

The *silica* content of 22 samples, representing more than two-thirds of the total number of samples analyzed, is below 1%. Seven samples contain between 1 and 2%, and two samples more than 3%. From the results obtained it does not seem that a maxi-

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*Published by permission of the Director of the National Bureau of Standards.

[3] Lunge, "Soda Industry," Vol. III, 2nd ed., p. 366.

[4] Gill, *Industrial and Engineering Chemistry*, 16, 577 (1924).

[5] *Proc. Am. Soc. Testing Materials*, 25, 618 (1925); (C25-25T).

[6] Knop, *J. Am. Chem. Soc.*, 46, 263 (1924).

[7] *Bur. Standards, Sci. Paper* 286.

[8] *Bur. Standards, Circ.* 163.

[9] Scott, "Standard Methods of Chemical Analysis," Vol. I, p. 362.

[10] Treadwell and Hall, "Analytical Chemistry," Vol. II, p. 617.

[11] *Bur. Standards, Circ.* 3, 4th ed., p. 7.

[12] Hillebrand, *U. S. Geol. Survey, Bull.* 700.

mum limit for SiO_2 of 1% in limes for chemical purposes would be unreasonable.

With the exception of one sample, the *iron* content was uniformly low, all samples containing less than 1%. The raw samples containing a relatively large amount of iron, but low in manganese, were not badly discolored—a light cream tint. The results show that lime with an iron content of less than 0.5% may be easily secured.

The *alumina*, as determined by difference, exhibited wide variation—from "not detected" to 2.75%. According to the table of analyses, 65% of the samples contained less than 1% of this constituent.

Fifteen samples contained small amounts of *phosphorus*. However, the results further show that it is not impossible to obtain "phosphorus-free" limes.

Manganese was found in practically all samples, but generally in extremely small amounts. Manganese apparently affects the color of the lime more than any of the other constituents, giving the samples a grayish tint. As the manganese content decreases the color of the samples becomes lighter.

The high-calcium limes were uniformly high in total *calcium oxide*, indicating that the material was produced from stone carefully selected for chemical lime. Two samples, one hydrate and one quicklime, contained calcium oxide and magnesium oxide in dolomitic proportion.

The *sulfur* (SO_3) content of the samples varied over a wide range. It has been suggested that the SO_3 may be introduced or increased by burning limestone with coal containing sulfur.

Lime that is stored may be expected to show some recarbonation, depending upon the method of storage. Where a low carbon dioxide content is desirable, lime should be used as soon as possible after burning.

General Physical Characteristics. The quicklime varied from soft, friable materials to hard, dense lumps. In a few of the harder quicklimes silica was present as flinty particles approximately ⅛ in. in size, easily discernible by visual inspection. Material of this nature would be particularly deleterious to processing machinery, such as piston pumps, etc. Abrasive action holds true for all silica; however, a good share of the SiO_2 is present in the sample, not as silica but as silicates.

The quicklimes varied widely in rate of hydration; some hydrated immediately while others required fully an hour.

The color of the quicklimes varied from a chalk-white to a grayish brown.

The hidrates were the usual soft, fine, impalpable powders free from lumps. The hydrates were generally white and with less variation in color than the corresponding quicklimes.

Acknowledgment

The author wishes to express appreciation to F. W. Smither and R. S. Rudy of the Chemistry Division, Bureau of Standards, for many helpful suggestions which greatly aided in the work.

A. S. T. M. Proceedings for 1927 Meeting Published

THE proceedings for the 1927 annual meeting of the American Society for Testing Materials have recently been issued. This year's volume comes in two parts, the first containing the reports of committees, revisions of standard specifications, and annual reports of the officers, while the second part is made up of 3 technical papers with the discussion of the same. Included in the list of papers are a number on cement and concrete which will undoubtedly prove interesting to readers of Rock Products. One of these is the paper by P. H. Bates, chief of the Division of Cement, Concrete, Lime and Ceramics of the U. S. Bureau of Standards, on "Long-Time Tests of High-Magnesia Portland Cements," which is a discussion of some work done by the Bureau of Standards. J. O. Draffin's paper on the "Tensile Strength of Portland Cement Constituents" is a study of data also obtained by the Bureau of Standards and worked out at the University of Illinois, where Mr. Draffin is assistant professor of mechanics. The symposium on field control of the quality of concrete contains two papers of note to Rock Products readers, the discussion on "Proportion of Concrete" by R. W. Crum, of the Iowa State Highway Department, and a paper on "Mixing of Concrete" by Duff Abrams.

Bureau of Mines Report On Mineral Resources in 1924

THE U. S. Department of Commerce has just published the report of the Bureau of Mines on the "Mineral Resources of the United States in 1924." The report comes in two volumes, the first containing a review of the metals, while the second includes the non-metals. The second volume contains nearly 800 pages, almost half of which are given over to petroleum, coal and allied products. The balance is made up of data on rock products. The reviews for each product contain data on production (amount and value), shipments, exports, imports and other tables. The chief reviews are on lime, cement, stone, sand and gravel and phosphate rock, although all other products are thoroughly covered.

COMPOSITION OF CHEMICAL LIMES

(Figures in per cent)

Sample	SiO_2	Fe_2O_3	Al_2O_3	P_2O_5	$MnsO_4$	CaO	MgO	SO_3	CO_2	Loss on Ignition	Insoluble Matter in 1:9 HCl
1*	0.70	0.04	0.74	ND	ND (0.0017)	71.51	1.56	1.25	1.64	23.50	0.06
2	0.27	0.16	0.26	0.02	ND (0.0025)	72.90	ND	0.27	1.19	25.56	0.44
5*	0.50	0.04	0.74	ND	T	73.89	0.70	ND	0.90	23.40	0.57
6	0.20	0.10	2.30	T	0.03	73.45	0.18	T	0.05	24.52	0.10
7*	2.84	0.33	0.99	ND	T	70.57	0.11	T	1.60	24.50	0.86
8*	0.44	0.01	0.77	0.01	0.15	98.90	0.38	T	0.03	0.05	0.51
9	0.17	0.14	1.04	0.02	T (0.006	73.10	0.44	0.48	0.77	24.34	0.44
11*	1.50	0.18	0.58	T	ND (0.0044)	96.12	0.36	T	0.28	1.40	0.04
12	1.54	0.16	1.75	0.01	T	70.06	0.94	T	1.70	24.90	0.32
13	1.79	0.19	1.17	0.02	T	71.54	0.76	0.31	0.31	24.20	0.48
14	0.04	0.07	0.81	0.01	ND	49.58	31.05	0.81	0.71	17.40	9.55
15*	0.48	0.92	ND	T	T	58.12	36.17	3.33	0.66	0.70	0.66
16	1.03	0.31	0.84	ND	0.10	74.41	0.82	T	1.34	21.80	0.19
17*	3.46	0.25	0.76	0.03	0.05	94.15	0.95	T	0.04	0.86	2.77
18*	4.01	0.10	1.73	T	T	77.70	0.40	ND	1.72	15.10	0.20
19*	0.36	0.04	0.67	ND	T	75.09	0.60	T	0.82	22.80	0.24
20*	2.32	0.12	0.84	ND	T (0.0059)	76.07	0.18	0.87	0.24	19.90	0.87
21*	0.26	0.06	0.62	0.08	T	96.70	1.82	T	0.07	0.42	0.44
22	1.06	0.07	0.50	0.01	T	73.51	0.40	0.11	0.74	24.22	0.49
23	1.08	0.17	0.64	0.07	ND (0.0024)	72.46	1.24	0.45	0.67	23.68	0.23
24*	0.44	0.09	0.85	T	T	73.40	0.44	T	0.62	24.19	0.49
25*	0.40	0.01	1.01	ND	ND (0.0044)	74.45	0.40	0.43	0.72	22.70	0.50
26	0.11	0.02	0.06	0.03	ND	70.82	3.88	0.43	0.66	24.76	0.44
27	0.66	0.28	1.48	0.01	T	72.55	1.78	1.68	1.06	21.09	0.37
28*	0.38	0.04	0.20	0.01	T	97.50	0.36	T	0.02	1.60	0.20
29*	1.00	0.06	0.32	T	T	97.35	0.36	0.95	0.04	0.60	0.55
30	1.02	0.11	1.12	0.01	ND (0.0015)	73.52	0.54	0.30	0.69	23.60	0.24
31	0.88	0.06	1.13	T	T	73.26	0.78	0.14	0.51	23.54	0.52
32*	0.72	0.07	0.17	T	ND (0.0044)	97.85	0.22	T	0.26	1.37	0.16
33	0.84	0.10	1.03	T	T	71.34	1.84	1.50	0.78	23.42	0.49
34	0.65	0.02	0.58	0.01	ND	74.22	0.36	0.24	0.82	24.06	0.50
35*	0.30	T	0.38	ND	ND	73.22	0.80	0.54	2.04	23.30	0.70
36	0.95	0.08	0.68	ND	0.03	72 52	0.20	0.04	0.77	25.44	0.49
37*	0.22	0.08	0.62	ND	T	97.24	0.83	0.84	2.46	0.60	0.46
38*	0.40	0.04	0.82	ND	ND	75.43	0.25	0.75	0.67	22.40	0.43

ND = less than 0.005%; T — trace (less than 0.01%).
*Quicklimes.

Comments on the Lime Industry

THE ANNUAL REVIEW of the American lime industry published in ROCK PRODUCTS, December 24, 1927, has created considerable comment amongst the lime producers. Two of our readers have written on the subject at length and we are reproducing their letters herewith. We shall be pleased to accord similar space to any other letters on the status of the lime industry. The letters follow:

Suggested Remedies for the Lime Industry

By A. S. DERINGER
Oak Harbor, Ohio

AMONG the questions asked in a recent issue of ROCK PRODUCTS was "What Ails the Lime Industry?" or words to that effect. This seemed to receive the greatest variety of answers and opinions as well as solutions for the present chaotic condition, all of which were both interesting and amusing. Amusing because many were in direct conflict with others. What one producer considered as an ailment and a specific remedy of the industry was not considered so by others.

Some claimed the present condition existed because of the lack of a standardized product. Others said that because of a variety of products due to natural conditions in the various lime producing localities, there can be no standardization of products.

Since it is impossible to make a standardized product by natural means, it would be necessary to resort to artificial methods. Even this would not assure a standard product, and would be economically impossible for some plants were it possible to produce even a semblance of what would be termed a standard product.

Some placed most stress on the lack of co-operation—that to enjoy a return of the former prosperous condition there must be a close harmonious co-operation. That the sections most favored by nature, both as to raw material, quality of product and accessability to ready markets have and show consideration for the producer not so favored.

Others claimed that to bring about a spirit of co-operation in the industry at large, was impossible because of a lack of confidence among producers and because of the variety of conditions confronting the various producers.

National Association Broke Down Unity

The action of the National Lime Association was largely responsible for the breaking down of the confidence so necessary for unanimity among the producers, when it sanctioned the various sections to organize independent of the national association. The sanction did much to create just the kind of a situation that should have been avoided.

I was glad to see that several operators have come to realize that the industry must be alive to combat the substitutes fast making inroads on their product. Some producers do not consider the matter of substitutes serious enough to be deserving of the consideration it should have for their mutual protection. They are so satisfied with their condition as to think no substitute can take the place of lime. It is this self-satisfied attitude which is going to spell ruination to the industry unless they come to their senses and resort to diligent united efforts to combat the substitutes.

To substantiate my claims that it behooves the lime industry to be on the alert against the substitute products, I have in mind two recent structures.

The only lime used in the construction of these buildings was in building the chimneys. The foundations under both buildings were of concrete, and in the place of plaster, substitute products were used and these were applied in less than one fourth the time it would have required to apply lath and plaster.

Consolidation of Interests Necessary

Some producers claim that consolidation of plants and interests would bring about the necessary relief for the present condition of the industry. Others claim the time is not yet for consolidation because of the diversity of products and their uses. It is my contention that the time was, the time is now, and the time always will be for consolidations, notwithstanding the arguments to the contrary ascribed against the practicability of consolidation. Consolidation of not only lime producers, but of lime and gypsum producers because of their closely allied and competitive products is the one and only specific thing that will remedy the condition that confronts the industry today.

Unless some abnormal national condition arises that will enable the industry to again experience a number of fat years, there is no apparent solution in sight under normal business conditions than one or more good, strong, financially able consolidations, with ability to analyze and do much to remedy conditions as they arise and with perception to meet the demands of the trades. An organization that can perfect undreamed and unheard of methods for more economical and better products. In fact, be able to carry on research work for the advancement of the industry that no individual concern could carry on because of the prohibitive cost.

A great many men decry the existence of so-called "Big Business." I am from Missouri, and must be shown that "Big Business" is not a boom to the particular business of which it is a part.

Does the oil business in general suffer because of the Standard Oil Co.?

Does the steel business in general suffer because of the U. S. Steel Corporation?

Improvements in manufacture, new uses for their product discovered by endless research, economies in the methods of production, a more or less recognized standard product, nation-wide advertising, all these and many more are the results of so-called "Big Business" that has been made possible by the pooling of individual interests. Until some such condition is brought about by and for the lime industry, can we hope for relief.

Finishing Lime Association Firmly Organized

By L. E. JOHNSON
Secretary, Finishing Lime Association of Ohio

THE finishing lime industry at the present time is not in a chaotic condition, but is firmly organized, and manufactures a quality product which has a national distribution. They are firmly united both in thought and action as to co-ordinated promotional effort in opening district offices carrying on educational and promotional work. In this, they represent the most progressive group in the lime industry, and are also the first unit in the lime industry to admit that there is a wide difference in limes, and that for the different limes there are particular uses to which they are adaptable.

With reference to plastic lime or hydrate, I do not feel that the problem of producing this successfully has been achieved, and I do not believe that it would be a good thing for the industry, if it were developed, for the reason that there is a small overproduction of finishing hydrated lime existing now, and with the advent in the market of other limes serving the same purpose that finishing hydrated lime does, it would only cause an increased overproduction, without any opportunity in the near future of building up additional tonnage to take care of it. Therefore, if the lime industry in general is in a chaotic condition, as your analysis seems to imply, this condition would only further aggravate it by the marketing of a finishing hydrated lime or lump lime.

It would seem to me much more logical for those manufacturers of lime who are complaining at the present time as to the conditions in their industry, if they through co-ordinated promotional effort would attempt to regain the tonnage for those products to which their lime is adaptable, rather than let the tonnage slip, and endeavor to discover ways and means of making their lime serve a purpose for which it never was intended.

Editorial Comment

No Fictitious Prices, Please!

Every once in a while a fresh incentive arises for us to write a little editorial in regard to the price quotations on rock products, which are a regular feature of ROCK PRODUCTS. It costs us a lot of time and money and effort to maintain this department of the paper. It costs our friends a little time and effort—and a sincere desire to co-operate—to make these quotations worth while. They are not worth while unless they are honest-to-goodness, bona fide quotations—the actual selling prices. In the long run the producer who does not quote actual prices is fooling no one, and he is seriously injuring his industry, as we will demonstrate.

A producer writes to us recently: "Based on quotations in your January 7 issue the average prices for —— states ran as follows: ¼-in. down, $1.14; ½-in. and less, $1.52; ¾-in. and less, $1.38; 2½-in. and less, $1.34, and 3-in. and larger, $1.34 per ton. The average price of all sizes is $1.36 per ton. Prices which we have tried to maintain and are going to try to maintain this coming season are: ¼-in. down, $1.40; ¼-in. to ⅝-in., $1.40; 1¼-in. to ⅝-in., $1.35; 2-in. to ⅝-in., $1.30; 2¾-in. to ⅝-in., $1.25 per ton. This makes an average for all sizes of $1.32 per ton. A discount of 10c. per ton is allowed on all these prices to dealers. I have been basing this scale of prices on what seems to be a fair average for this section of the country, and still give the customer a little the best of the bargain in every case except screenings, in which case the price is fixed by a definite demand for these for a concrete products operation.

"According to the prices of one or two ruthless competitors in this section, our prices are too high, although I know, as well as you probably know, that the prices listed above are necessary for the healthy continuance of the industry. Still it might be our prices are too high to deal with current prices. What I would like to know is this: Are these prices quoted regularly in ROCK PRODUCTS actual market prices and ledger book prices, or are they merely mythical prices which the operator feels he should receive, but doesn't? Though I feel that getting too far away from such a scale of prices is merely another means of 'self-hanging,' still, if one wishes to be active in the industry one must do very much as the majority does."

The last part of the above quotation is "a mouthful"—"if one wishes to be active in the industry one must do very much as the majority does." In other words the individual producer stands or falls with the industry of his section as a whole. Theoretically the selling price of a commodity is the cost of production plus a fair profit. Actually the selling price is the price set by the producer who wants or needs the business most. Provided this price is above that producer's cost, every other producer is obliged sooner or later to meet it. It then is a matter of experiment and experience to find out whether *his* cost is above or below this price.

We answered our correspondent's letter something as follows: "In the case of some of the companies quoting in your section of the country we feel sure from personal acquaintance with the principals and faith in their integrity that the prices quoted are bona fide prices. Undoubtedly there are producers who quote us fictitious prices. Whenever we know they are fictitious we eliminate them from our quotations, because we know that there are many producers like yourself who use our quotations as a guide in determining their own prices. There are, of course, as everyone familiar with the industry knows, dealer discounts and sometimes cash discounts not shown in the published quotations."

Our object in publishing these quotations is for just the purpose this producer uses them. It is just exactly the same as a merchant who labels the price of his goods. All his competitors may either come and read the price, or send someone to do it for them, if competitors are not on speaking terms. Other merchants may or may not set the same prices on the same articles, but at least they know the current market prices.

But ROCK PRODUCTS is a medium that can be and is seen by the consumers of the commodities as well as the producers. Wouldn't any merchant be a fool if he put fictitious price labels on his goods in the hope of misleading his competitors? Wouldn't he run the risk of losing good customers who might take his fictitious prices seriously, while none of his competitors would?

Well, that is just the position of a producer who makes fictitious quotations for publication in ROCK PRODUCTS. While we never under any circumstances divulge the source of these quotations without the written permission of the producer who makes them, if they are fictitious, they give a misleading idea of the prices in those localities and may result in steering business elsewhere. We don't want to be a party to spreading misleading information of any character.

ROCK PRODUCTS quotations have been read into the record in several court trials, and at Interstate Commerce Commission hearings, and have been and are quite universally accepted as reliable and authoritative. We are sure in most cases they are. So we ask you, our reader and friend, to take these quotations seriously, and not quote at all, if not honest prices. We are constantly solicited to include in our quotations new producing points, because producers tell us they find large buyers using our quotations as guides to fair prices, so we are sure we can get plenty of honest quotations.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

(These are the most recent quotations available at this printing. Revisions, corrections and supplemental information will be welcomed by the editor.)

Stock	Date	Par	Price bid	Price asked	Dividend rate
Allentown Portland Cement Co. (common)[37]	Dec. 30	.....	3	7	
Allentown Portland Cement Co. (6% bonds, 1932)[22]	Dec. 5	.....	90	92	
Alpha Portland Cement Co. (common)[2] new stock	Jan. 31	No par	36	43	**75c quar.** Jan. 14
Alpha Portland Cement Co. (preferred)[2]	Jan. 31	100	.....	115	**1¾%** quar. June 15
American Lime and Stone Co. (7% bonds, 1942)[22]	Jan. 13	.....	100½	101½	
Arundel Corporation (sand and gravel—new stock)	Jan. 31	No par	46½	46½	**50c quar.**; $1 ex. Jan. 16
Atlantic Gypsum Products Corp. (1st 6's carrying 10 sh. com.)[10]	Feb. 1	.....	110	112	
Atlas Portland Cement Co. (common)[3]	Jan. 28	No par	39½	41½	50c qu. Sept. 1
Atlas Portland Cement Co. (preferred)	....	100	.....	.....	2% qu. Oct. 1
Atlas Portland Cement Co. (preferred)[3]	Jan. 31	33⅓	43	.....	2% qu. Jan. 3
Beaver Portland Cement Co. (1st Mort. 7's)[8]	July 29	100	100	100	
Bessemer Limestone and Cement Co. (Class A)[4]	Jan. 31	.....	36	37	75c quar. Feb. 1
Bessemer Limestone and Cement Co. (6½% bonds)[4]	Nov. 4	.....	100¼	101	
Boston Sand and Gravel Co. (common)	Jan. 31	100	77¼	81	$1 qu., $1 ex. Jan. 2
Boston Sand and Gravel Co. (preferred)	Jan. 31	.....	80	85	1¾% quar. Jan. 1
Boston Sand and Gravel Co. (1st preferred)	Jan. 31	.....	90	95	2% qu. Jan. 1
Canada Cement Co., Ltd. (new common)	Feb. 1	.....	32	33	
Canada Cement Co., Ltd. (new preferred)	Jan. 31	.....	98½	99	
Canada Cement Co., Ltd. (new units)	Nov. 4	.....	107	107½	
Canada Crushed Stone Corp., Ltd. (6½s, 1944)[11]	Jan. 31	100	96	99	
Charles Warner Co. (lime, crushed stone, sand and gravel)	Jan. 28	No par	38	.....	**50c quar.**; 50c ex. Jan. 12
Charles Warner Co. (preferred)	Jan. 28	100	108	.....	1¾% quar. Jan. 26
Cleveland Stone Co. (new stock)	Jan. 31	.....	70	73	50c qu. 50c ex. Dec. 1
Connecticut Quarries Co. (1st Mortgage 7% bonds)[17]	Dec. 30	100	Called		
Consolidated Cement Corp. (1st Mort., 6½s, series A)[24]	Feb. 1	100	95	99	
Consolidated Cement Corp. (5 yr. 6½% gold notes)[24]	Feb. 1	100	95	98	
Consumers Rock and Gravel Co. (1st Mort. 7s)[18]	Jan. 27	100	99½	101½	
Coosa Portland Cement Co. (6% bonds, 1944)[22]	Dec. 28	.....	65	75	
Coplay Cement Manufacturing Co. (6% bonds, 1941)[32]	Dec. 28	.....	50	.....	
Coplay Cement Manufacturing Co. (common)[39]	Dec. 20	.....	11	.....	
Dewey Portland Cement Co. (1st mort. 6's 1942)[20]	Feb. 1	100	99	101	
Dolese and Shepard Co. (crushed stone)[7]	Feb. 1	50	110	.....	1.50 Jan. 1, 1.50 ex. Jan. 1
Edison Portland Cement Co. (common)[39]	Jan. 27	.....	50c	.....	
Edison Portland Cement Co. (preferred)[39]	Jan. 27	.....	1	.....	
Edison Portland Cement Co. (bonds)[39]	Jan. 27	.....	75	.....	
Egyptian Portland Cement Co. 7% pfd.[21]	Jan. 28	.....	90	95	1¾% quar. July 1
Egyptian Portland Cement Co. (common)[21]	Jan. 28	.....	5	7	40c quar. Oct. 1
Egyptian Portland Cement Co. (warrants)	Jan. 28	.....	No market		
Fredonia Portland Cement Co. (6½% bonds, 1940)[22]	Dec. 5	.....	97	101	
Giant Portland Cement Co. (common)	Jan. 31	50	35	45	
Giant Portland Cement Co. (preferred)	Jan. 31	50	40	45	3½% Dec. 15
Ideal Cement Co. (common)	Feb. 1	No par	101	103	**$1 quar.**; $1 ex. Jan. 1
Ideal Cement Co. (preferred)[23]	Feb. 1	100	110	112	1¾% quar. Jan. 1
Indiana Limestone 7's (1936)	Nov. 9	.....	98	100	
International Cement Corporation (common)	Feb. 1	No par	60⅜	.....	$1 quar. Dec. 31
International Cement Corporation (preferred)[2]	Feb. 1	100	108	110	1¾% quar. Dec. 31
Kelley Island Lime and Transport Co. (new stock)	Jan. 31	100	53½	55	62½c quar. Jan. 1
Lawrence Portland Cement Co.[3]	Jan. 31	100	109	112	2% quar.
Lehigh Portland Cement Co.	Jan. 31	50	124	128	1½% quar.
Lehigh Portland Cement Co. (preferred)	Jan. 31	.....	107	109	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1928 to 1931)[13]	Aug. 12	100	99½	100	
Lyman Richey Sand and Gravel Co. (1st Mort. 6s, 1932 to 1935)[13]	Aug. 12	100	97½	99	
Marblehead Lime Co. (1st Mort. 7's)[14]	Jan. 28	100	100	.....	
Marblehead Lime Co. (5½% notes)[14]	Jan. 28	100	98	.....	
Michigan Limestone and Chemical Co. (common)[6]	Feb. 1	.....	35	.....	
Michigan Limestone and Chemical Co. (preferred)[6]	Feb. 1	.....	24	26	1¾% quar. July 15
Missouri Portland Cement Co.	Feb. 1	25	41	41	50c Feb. 1
Monolith Portland Cement Co. (common)[9]	Jan. 26	.....	14	14½	8% ann. Jan. 2
Monolith Portland Cement Co. (units)[9]	Jan. 26	.....	32½	34	
Monolith Portland Cement Co. (preferred)[9]	Jan. 26	.....	9¼	9¾	
National Cement Co. (7% bonds)[25]	Jan. 28	100	96	99	
National Gypsum Co. (common A)[33]	Feb. 1	.....	23	25	
National Gypsum Co. (preferred)[35]	Feb. 1	.....	69½	71½	
Nazareth Cement Co.[30]	Jan. 27	No par	32	34	75c quar. Apr. 1
Newaygo Portland Cement Co.[1]	Dec. 30	.....	115	.....	
Newaygo Portland Cement Co. (6½% bonds, 1938)[22]	Dec. 28	.....	101	103	
New England Lime Co. (Series A, preferred)[14]	Jan. 28	100	.....	95	
New England Lime Co. (Series B, preferred)[22]	Jan. 27	100	97	.....	
New England Lime Co. (V.T.C.)[22]	Jan. 27	.....	34	.....	
New England Lime Co. (6s, 1935)[14]	Jan. 28	100	98	100	
New York Trap Rock Corp. (6% bonds, 1946)[22]	Feb. 1	.....	101¼	101¼	
North American Cement Corp. 6½s 1940 (with warrants)	Feb. 1	100	84	84	
North American Cement Corp. (units of 1 sh. pfd. plus ½ sh. common)[19]	Jan. 28	.....	40	45	2 mo. period at rate of 7%
North American Cement Corp. (common)[19]	Apr. 9	.....	8⅛	9	
North American Cement Corp. (preferred)	Apr. 25	.....	.....	.....	1.75 quar. Aug. 1
North Shore Material Co. (1st Mort. 6's)[12]	Feb. 1	100	99	.....	
Northwestern States Portland Cement Co.[27]	Nov. 21	.....	165	170	

[1]Quotations by Watling, Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by True, Webber & Co., Chicago. [4]Quotations by Butler, Beading & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]Quotations by F. M. Zeiler & Co., Chicago, Ill. [8]Quotations by Ralph Schneeloch Co., Portland, Ore. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]E. B. Merritt & Co., Inc., Bridgeport, Conn. [13]Peters Trust Co., Omaha, Neb. [14]Second Ward Securities Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hemphill, Noyes & Co., New York. [20]Quotations by Bond & Goodwin & Tucker, Inc., San Francisco. [21]Baker, Simonds & Co., Inc., New York. [22]Pirnie, Simons and Co., Springfield, Mass. [23]Blair & Co., New York and Chicago. [24]A. B. Leach and Co., Inc., Chicago. [25]A. C. Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [27]J. G. White and Co., New York. [28]Mitchell-Hutchins Co., Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago. [31]McIntyre & Co., New York, N. Y. [32]Hepburn & Co., New York. [33]Boettcher & Co., Denver, Colo. [34]Kidder,, Peabody & Co., Boston, Mass. [35]Farnum, Winter and Co., Chicago. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick and Co., Montreal, Que. [39]Tobey and Kirk, New York.

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS (Continued)

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Pacific Portland Cement Co. (common, new stock)	Jan. 29	.....	25	.....	
Pacific Portland Cement Co., Consolidated[6]	Oct. 21	100	61¼	.....	25c mo.
Pacific Portland Cement Co., Consolidated (preferred)	Jan. 29	.....	.....	82	
Pacific Portland Cement Co., Consolidated (secured serial gold notes)[6]	Jan. 27	100	98	99	3% semi-annual Oct. 15
Peerless Portland Cement Co.[1]	Dec. 30	10	4	4⅝	
Pennsylvania-Dixie Cement Corp. (1st Mort. 6's)[20]	Feb. 1	100	99	99⅜	
Pennsylvania-Dixie Cement Corp. (preferred)[20]	Feb. 1	100	95	.....	1¾% Jan. 3
Pennsylvania-Dixie Cement Corp. (common)[20]	Feb. 1	.....	26⅛	27⅜	60c Jan. 3
Petoskey Portland Cement Co.[1]	Feb. 1	10	11¾	12½	1½% quar.
Pittsfield Lime and Stone Co.[21]	Oct. 8	.....	.....	100	
Pittsfield Lime and Stone Co.[21] (common)	Oct. 8	.....	.....	25	
Riverside Portland Cement Co.	Jan. 29	.....	160	.....	50c monthly, $1.50 ex. Aug. 1
Rockland and Rockport Lime Corp. (1st preferred)[24]	Jan. 27	100	.....	100	3½% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (2nd preferred)[24]	Jan. 27	100	.....	65	3% semi-annual Feb. 1
Rockland and Rockport Lime Corp. (common)[24]	Jan. 27	No par	.....	50	1½% quar. Nov. 2
Sandusky Cement Co. (common)[1]	Jan. 31	100	164	.....	$2 quar.; $4 ex. Jan. 1
Santa Cruz Portland Cement Co. (bonds)[5]	Jan. 26	.....	105	106	6% annual
Santa Cruz Portland Cement Co. (common)[5]	Jan. 29	.....	87	90	$1 quar., $1 ex. Jan. 1
Schumacher Wallboard Corp. (common)	Jan. 29	.....	25	25½	
Schumacher Wallboard Corp. (preferred)	Jan. 29	.....	26	28	
Southwestern Portland Cement Co. (units)	May 11	.....	205	.....	
Superior Portland Cement, Inc. (Class A)[30]	Jan. 29	.....	48	48½	
Superior Portland Cement, Inc. (Class B)[30]	Jan. 26	.....	32	34	
Trinity Portland Cement Co. (units of 1 sh. pfd. and ½ sh. com)[27]	Jan. 28	.....	158	165	
Trinity Portland Cement Co. (common)[27]	Dec. 19	.....	50	60	
United Fuel and Supply Co. (sand and gravel) 1st Mort. 6s[27]	July 14	100	98	100	
United Fuel and Supply Co. (sand and gravel) 6% gold notes[27]	July 14	100	98	100	
United States Gypsum Co. (common)	Feb. 1	20	81¾	81¾	40c qu. $1 ex. Dec. 31
United States Gypsum Co. (preferred)	Feb. 1	100	123½	123½	1¾% quar. Dec. 31
Universal Gypsum Co. (common)[3]	Jan. 4	No par	3¼	3½	
Universal Gypsum V.T.C.[3]	Dec. 7	No par	3	3½	
Universal Gypsum Co. (preferred)[3]	Dec. 7	.....	32	35	1¼% Feb. 15
Union Rock Co. (7% serial gold bonds)[18]	Oct. 7	.....	Called as of Nov. 1, 1927		
Upper Hudson Stone Co. (1st 6's, 1951)[23]	Dec. 28	.....	92	.....	
Upper Hudson Stone Co. (1st 6's, 1937)[23]	Dec. 28	.....	Called		
Vulcanite Portland Cement Co. (7½% bonds, 1943)[22]	Dec. 5	100	105	109	
Whitehall Cement Mfg. Co. (common)[28]	Jan. 28	.....	150	.....	
Wisconsin Lime and Cement Co. (1st Mort. 6's, 1940)[25]	Feb. 1	100	99	.....	
Wolverine Portland Cement Co.	Jan. 31	.....	6	6	15c Feb. 15
Yosemite Portland Cement Co. (Class A, common)	Jan. 4	10	6	.....	

QUOTATIONS OF INACTIVE ROCK PRODUCTS SECURITIES

Stock	Date	Par	Price bid	Price asked	Dividend Rate
Asbestos Corp. of America (5 sh. pfd. and 5 sh. com.)[1]	June 22	.....	$1 for the lot		
Atlanta Shope Brick and Tile Co.[1]	Nov. 24	.....	25c	.....	
Benedict Stone Corp. (cast-stone) (50 sh. pfd. and 390 sh. com.)[1]	Dec. 29	.....	$400 for the lot	.....	
Blue Stone Quarry (60 shares)[2]	Mar. 16	.....	$10¼ for the lot	.....	
Coplay Cement Mfg. Co. (common)[4]	Dec. 16	.....	12½	.....	
Coplay Cement Mfg. Co. (preferred)[1]	Dec. 30	.....	70	.....	
Eastern Brick Corp. (7% cum. pfd.)[1]	Dec. 9	10	40c	.....	
Eastern Brick Corp. (sand lime brick) (common)[1]	Dec. 9	10	40c	.....	
International Portland Cement Co., Ltd. (preferred)	Mar. 1	.....	30	45	
Globe Phosphate Co. ($10,000 1st mtg. bonds, $169.80 per $1000 paid on prin.)	Dec. 22	.....	$50 for the lot	.....	
Iroquois Sand and Gravel Co., Ltd. (2 sh. com. and 3 sh. pfd.)[1]	Mar. 17	.....	$12 for the lot	.....	
Knickerbocker Lime Co.(x)	June 22	.....	100	.....	
Limestone Products Corp. (150 sh. pfd., $50 par, and 150 sh. com., no par)	Dec. 22	.....	$60 for the lot	.....	
Missouri Portland Cement Co. (serial bonds)	Dec. 31	.....	104¾	104¾	3¼% semi-annual
Olympic Portland Cement Co.(g)	Oct. 13	.....	.....	£1⅛	
Phosphate Mining Co.[1]	Nov. 24	.....	1	.....	
River Feldspar and Milling Co. (50 sh. com. and 50 sh. pfd.)[1]	June 23	.....	$200 for the lot	.....	
Rockport Granite Co. (1st 6's, 1934)	Aug. 31	.....	90	.....	
Simbroco Stone Co.[2]	Apr. 20	.....	12	12	
Southern Phosphate Corp.[6]	Sept. 15	.....	1¼	.....	
Standard Gypsum Co. (10 sh. pfd. and 5 sh. com.)[1]	Dec. 28	.....	$35 for the lot	.....	
Tensas Gravel Co. (180 sh. com.)[1]	Nov. 17	.....	$1 for the lot	.....	
Tidewater Portland Cement Co. (3000 sh. com.)	Dec. 22	.....	$6525 for the lot	.....	
Vermont Milling Products Co. (slate granules) 22 sh. com. and 12 sh. pfd.)[6]	Nov. 3	.....	$1for the lot	.....	
Wabash Portland Cement Co.[1]	Aug. 3	50	60	100	
Winchester Brick Co. (preferred) (sand lime brick)[1]	Dec. 16	.....	10c	.....	

(g) Neidecker and Co., Ltd., London, England. [1]Price obtained at auction by Adrian H. Muller & Sons, New York. [2]Price obtained at auction by R. L. Day and Co., Boston. [3]Price obtained at auction by Weilupp-Bruton and Co., Baltimore, Md. [4]Price obtained at auction by Barnes and Lofland, Philadelphia, Penn. [5]Price obtained at auction for lot of 50 shares by R. L. Day and Co., Boston, Mass. (x) Price obtained at auction by Barnes and Lofland, Philadelphia, on November 3, 1925. [6]Price obtained at auction by Wise, Hobbs and Arnold, Boston, Mass.

Certain-teed Products Corp. Makes Offer for Beaver Board

CERTAIN-TEED PRODUCTS CORP. has made an offer to purchase the assets and properties of Beaver Board companies and subsidiaries and contracts have been signed for the consummation of the deal pending stockholders' acceptance and deposit of their stock. A letter is being sent to stockholders of Certain-teed Products Corp. notifying them of the special meeting to be held on February 14 to authorize a new 7% preferred issue to an amount not exceeding $25,000,000 in place of present first and second preferred stock.

Under the Certain-teed Products-Beaver Board merger plan the former company agrees to pay funded debt of Beaver Board companies and subsidiaries, amounting to $6,463,205; to assume all other liabilities of the Beaver Board companies and the Beaver Products, Inc., and to pay an amount equal to $40 a share upon outstanding preferred stock of Beaver Board companies and $5 upon each share of outstanding common assenting to the sale.

Under the terms of offer each holder of preferred stock of Beaver Board has the option to accept, instead of $50 cash, one-half of the new 7% cumulative preferred stock of Certain-teed Products.

Consummation of the purchase agreement is subject to deposit of not less than 80% preferred Beaver Board stock and 66 2/3% of common on or before February 29, 1928.

The Beaver Board directors have accepted these terms and contracts between the two companies have been signed. At a meeting to be held February 14 in Baltimore the stockholders of Certain-teed will be asked to amend the charter to permit the acquisition.

The Certain-teed company is one of the largest manufacturers of roofing and similar products in the United States. It makes, in addition, shingles, building and insulated papers, dry asphalt and tarred felts, linoleums, floor coverings, oil cloth, plaster and gypsum products, paints, varnishes and enamels.

Beaver Board's principal products are various types of wallboards.

This acquisition is understood to be a part of a considerable expansion program now under consideration by the Certain-teed Corp. Several other companies have been reported from time to time as possible participants in such a merger, but these developments have not as yet taken any tangible form.—*Chicago Journal of Commerce.*

Canada Cement to Redeem Outstanding 6% Bonds

ANNOUNCEMENT that the old issue of Canada Cement Co bonds will be redeemed next March at 110 and accrued interest was made recently as follows:

Wood, Gundy & Co., Ltd., announce that, notwithstanding the arrangement that has been made for the discharge of the mortgage on the property of the old Canada Cement Co., Ltd., they have been able to consummate an agreement whereby the outstanding bonds of the old company will be redeemed at 110% of par and accrued interest to March 3, 1928, the date fixed for redemption.

The original issue of these 6% bonds was $8,000,000 and they were a 20-year issue, due October 1, 1929. The annual report for 1926 shows $3,456,853 redeemed through sinking fund operations. The amount outstanding as at December 31, 1926, was $4,543,146.

International Cement Likely to Refinance

ACCORDING to a current report in the *Wall Street News*, the directors of the International Cement Corp. are giving consideration to the retirement of preferred stock through a bond or note issue. Should such step be decided upon it is not expected that definite action will be taken until the early spring.

International Cement Corp. has outstanding some $9,694,400 in 7% cumulative preferred stock, redeemable at 110 and interest on 30 days' notice. In addition to the preferred stock the only present capital liability of the company consists of 562,500 shares of common stock. Substitution of a note or bond issue paying a smaller rate of interest for the present preferred stock would result in substantial saving and larger common share earnings.

The report continues:

"Net earnings for 1927 are reliably estimated at in the neighborhood of $6.50 a share on common. This would be slightly in excess of net of $4,355,000 or $6.16 a share in 1926 and would establish a new high earnings record for the company. In 1925 earnings amounted to $7.55 a share, but on a much smaller capitalization than at present. Net for the first nine months of 1927 amounted to $4.87 a share against $4.72 shown in the preceding year.

"The year just concluded was not considered particularly favorable for cement makers generally, and for this reason anticipated results of International are considered satisfactory and an indication of leadership of this company in the industry.

"Price cutting and foreign competition interfered with what probably would have been a normal year for all companies.

"International now has plant capacity of some 14,700,000 bbl. annually, an increase of 2,000,000 bbl. over the past two years. This expansion has been largely financed through increased capitalization and earnings. The company is in a strong competitive position due to the strategic location of plants and is also entrenched in the South American field with plants in Cuba, Argentina and Uruguay."

Wolverine Portland Earnings Increased in 1927

THE Wolverine Portland Cement Co. for the year ended December 31 reported a net income of $82,444 after depreciation, depletion, federal taxes and all other charges, equal to 82 cents a share earned on 100,000 shares of $10 par stock outstanding. This compares with a net income of $12,038, or 12 cents a share, in the previous year. Net sales in 1927 totaled $752,491, as compared with $706,791 in 1926.

Comparison of the income account shows:

Year ended December 31—	1927	1926
Net sales	$ 752,491	$ 706,791
Cost of goods	522,947	555,640
Depreciation	73,396	74,942
Depletion	7,814	4,690
Sell. & admin. exps.	63,880	63,100
Operating profit	$ 84,452	$ 8,420
Other income	6,503	5,616
Total income	$ 90,955	$ 14,036
Prov. for income tax	8,511	1,997
Net income	$ 82,444	$ 12,038
Dividends paid	60,000	30,000
Surp'us for year	$ 22,444	$ 17,962
Previous surplus	192,345	210,519
Total surplus	$ 214,789	$ 192,557
Surplus dr. adjs.	30,988	212
P. & L. surplus	$ 183,802	$ 192,345

The company's balance sheet as of December 31 last reveals a strong financial position, with current assets of $643,182 as against current liabilities of $23,685. Cash amounted to nearly 10 times current liabilities. A comparative balance sheet follows:

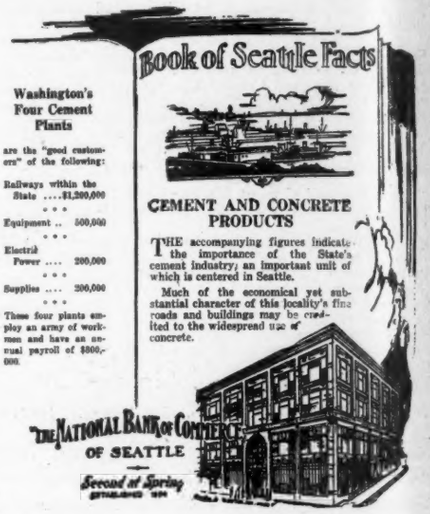
Assets		
As of December 31—	1927	1926
Fixed assets	$ 599,839	$ 641,134
Def. & other assets	4,504	26,575
Current assets—		
Cash	$ 233,768	$ 261,359
Marketable securities	28,355	29,479
Accts. rec. & accrued int.	25,131	50,607
Inventories	355,929	241,985
Total current assets	$ 643,182	$ 582,890
Total assets	$1,247,526	$1,250,599
Liabilities		
*Capital stock	$1,000,000	$1,000,000
Surplus	183,802	192,345
Fire insurance res.	40,039	37,668
Current liabilities—		
Accounts payable	$ 15,174	$ 18,589
Pro. for income tax	8,511	1,997
Total current liabilities	$ 23,685	$ 20,586
Total liabilities	$1,247,526	$1,250,599

*Represented by 100,000 shares of $10 par.

—*Chicago Journal of Commerce.*

What a Bank Thinks of the Cement Industry

THE accompanying illustration, taken from a Seattle newspaper, shows what a Seattle bank thinks of the cement industry in the state of Washington. When persons outside of the rock products industry, and particularly those interested in the financial side of the country's business, see fit to


Book of Seattle Facts
Washington's Four Cement Plants
are the "good customers" of the following:
Railways within the State $1,200,000
Equipment .. 500,000
Electric Power 200,000
Supplies 200,000
These four plants employ an army of workmen and have an annual payroll of $800,000.
CEMENT AND CONCRETE PRODUCTS
THE accompanying figures indicate the importance of the State's cement industry, an important unit of which is centered in Seattle.
Much of the economical yet substantial character of this locality's fine roads and buildings may be credited to the widespread use of concrete.
THE NATIONAL BANK OF COMMERCE OF SEATTLE
Second at Spring

Advertising the economic importance of the Washington cement mills to the community

give a "boost," unsolicited, to the cement industry, or to any other industry in the rock products "family," we feel that it is a real boost, and really merited, and so we are passing it on to you. Does your community boost your industry?

British Cement Mills Merge

THE *Municipal Journal*, London, England, reports the consolidation of the following English cement manufacturers: Ship Canal Portland Cement Manufacturers, Ltd. (capital £1,030,175); the Halborough Cement Co., Ltd., Snodland, Kent (£500,000); Greaves, Bull & Lakin, Harbury, Leamington (£475,000); British Cement Products and Finance Co. (£200,000), and the Portland Cement Selling and Distributing Co., Ltd. (£250,000). The operations represent a combined capital approximating £2,500,000.

The *Journal* says: "Speedy transport to any part of the kingdom is one of the aims, and for that the works are favorably situated, and represent North, Midland and South. On the Manchester Ship Canal there is a deep-water wharf, and at Ellesmere Port, Cheshire, there are private sidings to the London, Midland and Scottish and the Great Western Railways. At Snodland there is an annual output of 200,000 tons of finished cement."

Portland Cement in December—Summary of Estimates by Months and Districts, 1927

Preliminary Estimates Indicate Production of 171,908,000 Barrels and Shipments of 170,922,000 Barrels in 1927

THE portland cement industry in December, 1927, produced 11,999,000 bbl., shipped 6,200,000 bbl. from the mills, and had in stock at the end of the month 21,821,000 bbl., according to the United States Bureau of Mines, Department of Commerce. Production of portland cement in December, 1927, showed an increase of nearly 12% and shipments a decrease of nearly 4% as compared with December, 1926, and portland cement stocks at the mills were nearly 8% higher than at the end of 1926. The preliminary totals for 1927 show increases of over 4% in production and more than 5% in shipments over the final totals for 1926. A summary of the preliminary estimates is given in the succeeding pages.

The output of another new plant, located in Colorado, is included in these statistics, which are compiled from reports for December from all manufacturing plants except two, for which estimates have been included in lieu of actual returns.

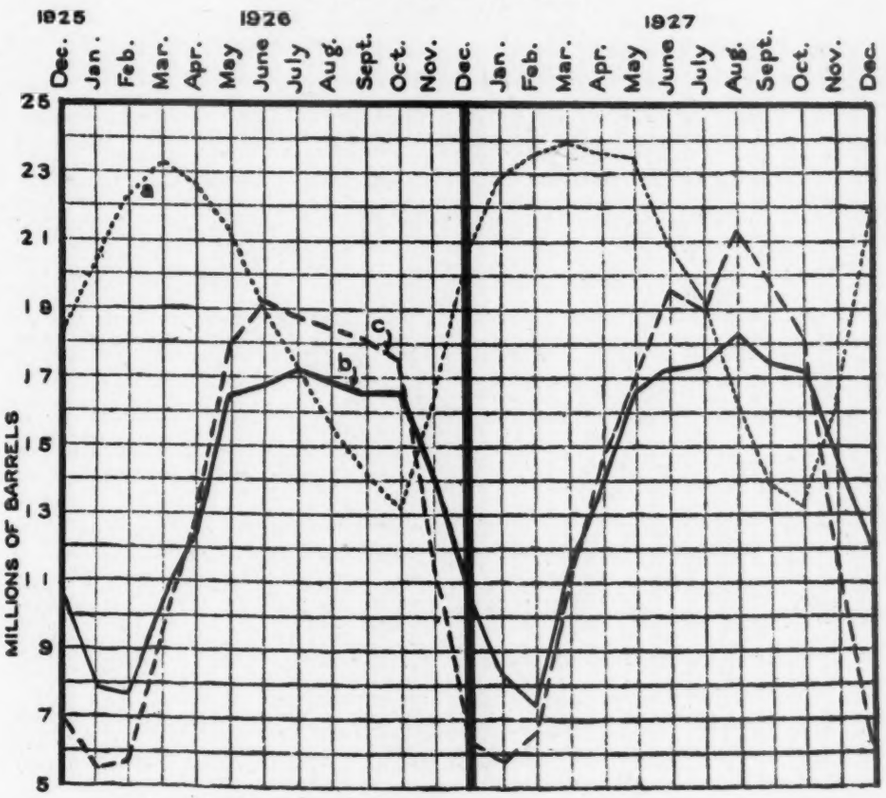
Relation of Production to Capacity

In the following statement of relation of production to capacity, the total output of finished portland cement is compared with the estimate capacity of 155 plants at the close of December, 1927, and of 141 plants at the close of December, 1926.

RELATION OF PRODUCTION TO CAPACITY

Period	Dec. 1927 Pct.	Dec. 1926 Pct.	Nov. 1927 Pct.	Oct. 1927 Pct.	Sept. 1927 Pct.
The month	60.7	60.0	75.9	87.4	92.6
12 mo. ended—	73.9	76.2	73.7	73.6	72.3

MONTHLY FLUCTUATION IN PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT



(a) Stocks of finished portland cement at factories; (b) Production of finished portland cement; (c) Shipments of finished portland cement from factories

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during October and November, 1926 and 1927:

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES, IN OCTOBER AND NOVEMBER, 1926 AND 1927, IN BARRELS*

Shipped to—	1926—Oct.	1927—Oct.	1926—Nov.	1927—Nov.
Alabama	169,086	268,221	134,009	252,077
Alaska	132	0	173	132
Arizona	44,360	40,461	27,412	52,276
Arkansas	70,785	92,180	79,627	85,638
California	1,276,210	1,170,744	887,351	1,027,706
Colorado	113,951	120,300	61,057	74,276
Connecticut	242,167	214,120	147,288	170,103
Delaware	44,898	34,107	17,682	20,630
District of Columbia	90,347	97,408	78,369	70,727
Florida	343,404	153,713	418,696	142,655
Georgia	148,699	153,271	161,710	143,624
Hawaii	16,887	23,201	21,417	8,726
Idaho	33,444	32,774	25,409	16,447
Illinois	1,918,899	1,892,207	776,758	880,391
Indiana	719,882	701,944	289,720	289,212
Iowa	501,683	527,340	116,116	123,547
Kansas	244,497	305,427	169,035	218,395
Kentucky	192,177	223,764	120,647	114,964
Louisiana	123,139	131,902	74,619	110,968
Maine	47,136	49,167	19,168	30,019
Maryland	270,241	258,427	212,972	180,358
Massachusetts	305,190	302,248	234,087	237,558
Michigan	1,159,596	1,270,331	702,901	641,339
Minnesota	384,739	345,054	87,777	96,509
Mississippi	68,149	105,002	61,685	97,083
Missouri	498,449	502,478	315,318	305,254
Montana	27,916	35,507	16,169	14,205
Nebraska	173,552	207,301	64,198	58,307
Nevada	7,955	5,381	4,751	6,789
New Hampshire	44,983	53,052	32,190	34,719
New Jersey	856,615	870,585	688,736	672,737
New Mexico	22,127	29,552	18,965	23,695
New York	2,107,119	2,119,748	1,584,352	1,514,114
North Carolina	382,736	302,904	276,568	264,393
North Dakota	30,647	27,700	8,969	5,437
Ohio	989,005	1,284,751	651,257	675,806
Oklahoma	188,144	301,163	225,767	319,776
Oregon	126,946	122,443	75,541	80,653
Pennsylvania	1,415,233	1,413,406	1,013,955	932,367
Porto Rico	0	500	7,250	0
Rhode Island	72,653	71,567	47,278	58,352
South Carolina	61,636	112,445	46,692	133,046
South Dakota	48,761	57,753	10,076	13,870
Tennessee	203,406	231,850	124,551	174,923
Texas	441,775	523,015	419,358	506,726
Utah	64,504	41,022	34,358	30,046
Vermont	34,591	52,392	14,455	21,938
Virginia	151,319	181,685	127,290	145,820
Washington	191,453	220,784	131,602	129,611
West Virginia	143,112	205,074	104,150	104,307
Wisconsin	582,919	541,528	169,068	214,907
Wyoming	15,475	15,102	8,160	15,407
Unspecified	13,132	1,954	54,253	32,465
	17,425,861	18,045,955	11,200,962	11,575,030
Foreign countries	60,139	59,045	75,038	43,970
Total shipped from cement plants	17,486,000	18,105,000	11,276,000	11,619,000

*Includes estimated distribution of shipments from three plants in October and November, 1927, and from five plants in October and November, 1926.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1926 AND 1927, IN BARRELS

Month	1926—Production	1927	1926—Shipments	1927	Stocks at end of month 1926	1927
January	7,887,000	8,258,000	5,674,000	5,968,000	20,582,000	22,914,000
February	7,731,000	7,377,000	5,820,000	6,731,000	22,385,000	*23,563,000
March	10,390,000	*11,450,000	9,539,000	*11,100,000	23.236,000	23,922,000
April	12,440,000	14,048,000	12,965,000	14 350,000	22,710,000	23,654,000
May	16,510,000	16,701,000	17,973,000	16.865,000	21,255,000	23,503,000
June	16,866,000	17,224,000	19,134,000	19,761,000	19,000,000	20,972,000
July	17,134,000	17,408,000	18,812.000	18,894,000	17,301,000	19,397,000
August	16,995,000	18,315,000	18,583,000	21.411.000	15.718,000	16.292,000
September	16,571,000	17,505,000	18,087,000	19,826,000	14,188,000	13,996,000
October	16,596,000	17,174,000	17,486.000	18,105,000	13,334,000	13,141,000
November	14,193,000	14,449.000	11,276,000	11,619,000	16,243,000	*16,022,000
December	10,757,000	11,999,000	6,432,000	6,200,000	20,679,000	21,821,000
Preliminary total	164,070,000	171,908,000	161,781,000	170,922,000	.....	.....
Amt. of underestimate	460,000	.....	406,000	.....	.....	.....
Final total	164,530,000	.....	162,187,000	.....	.....	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN DECEMBER, 1926 AND 1927, AND STOCKS IN NOVEMBER, 1927, IN BARRELS

District	Production 1926—Dec.—	1927	Shipments 1926—Dec.—	1927	Stocks at end of December 1926	1927	Stocks at end of Nov. 1927*
East'n Penn., N. J., Md.	2,875,000	2,941,000	1,582,000	1,671,000	4,081,000	5,034,000	3,765,000
New York	634,000	701,000	233,000	402.000	1.284,000	1,504,000	1,205,000
Ohio, W. Penn., W. Va.	851,000	970.000	543.000	445,000	2.461.000	2.595,000	2,069,000
Michigan	741,000	952,000	330,000	317,000	1.897,000	2.136,000	1,501,000
Wis., Ill., Ind. & Ky.	1,530,000	1,605,000	632,000	544,000	2,984,000	2,573,000	1,512,000
Va., Tenn., Ala., Ga., Fla.,† and La.‡	1,022.000	1,162,000	951,000	786,000	1.195,000	1,680,000	1,304.000
E. Mo., Ia., Minn., S. D.	904.000	1,247.000	284,000	240,000	2,937,000	2 731,000	1.724,000
W. Mo., Neb., Kan., Okla.	*616,000	713,000	380,000	357,000	1.777,000	1,622,000	1,265,000
Texas	379,000	514,000	316,000	358,000	444 000	407,000	252,000
Colo., Mont. & Utah	87,000	113,000	69,000	63,000	484 000	365,000	315,000
California	*982,000	902,000	978,000	890.000	667.000	788.000	776,000
Oregon and Washington	*136.000	179,000	134,000	127,000	468,000	386,000	334,000
	10,757,000	11,999,000	6,432,000	6,200,000	20.679.000	21.821.000	16,022,000

*Revised. †Began producing September and shipping October, 1927. ‡Began producing June and shipping July, 1927.

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1926 AND 1927

Month	Exports 1926 Barrels	1926 Value	1927 Barrels	1927 Value	Imports 1926 Barrels	1926 Value	1927 Barrels	1927 Value
January	72,939	$216,431	75,346	$254,072	360,580	$576,717	193,175	$269,661
February	73,975	220,706	71,404	233,985	314,118	527,948	130,421	200,680
March	69,080	205,647	67,956	240,165	493,241	812,968	181,145	261,519
April	96,296	284,772	72,383	243,832	257,302	398,114	191,868	313,262
May	78,601	224,365	59,332	205,574	223,130	337,031	178,929	263,618
June	80,684	248,814	69,205	237,281	335,570	495,744	129,111	201,682
July	130,822	370,220	72,337	229,737	250,862	395,981	175,035	249,665
August	64,946	216,489	61,371	209,198	350,638	560,532	117,605	170,167
September	70,920	239,174	57,888	207,817	194,129	308,224	233,066	297,716
October	69,389	225,874	67,639	230,668	263,403	386,335	221,274	321,777
November	76,598	238,103	79,869	257,476	55,233	82,949	141,485	190,419
December	89,976	305,238	.....	.....	151,850	246,293	.....	.....
	974,226	$2,995,833	.....	.....	3,250,056	$5,128,836	.....	.....

EXPORTS AND IMPORTS

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN NOVEMBER, 1927

Exported to—	Barrels	Value
Canada	2,641	$ 14,065
Central America	12,352	39,391
Cuba	5,369	13,019
Other West Indies and Bermuda	7,181	16,806
Mexico	7,485	24,718
South America	39,566	120,079
Other countries	5,275	29,398
	79,869	$257,476

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN NOVEMBER, 1927

Imported from	District into which imported	Barrels	Value
Belgium	Florida	25,662	$34,103
	Galveston	3,032	3,608
	Maine & N. H.	3,000	6,240
	Massachusetts	20,784	27,038
	Philadelphia	24,224	33,873
	Porto Rico	5	8
	Sabine	3,000	5,500
	South Carolina	20,660	25,616
	Total	100,367	$135,986
Canada	Maine & N. H.	2,000	$4,075
	St. Lawrence	500	940
	Total	2,500	$5,015
Denmark	Porto Rico	4,500	$5,984
Dominican Republic	Porto Rico	179	$784
France	San Francisco	68	$271
Germany	Los Angeles	1,013	$2,253
Norway	Philadelphia	9,009	$10,689
	South Carolina	18,741	22,451
	Total	27,750	$33,140
United K'gd'm	Florida	150	$200
	New York	4,958	6,786
	Total	5,108	$6,986
	Grand total	141,485	$190,419

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN NOVEMBER, 1927*

	Barrels	Value
Alaska	290	$875
Hawaii	21,419	49,675
Porto Rico	6,140	15,199
	27,849	$65,749

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

SUMMARY OF MONTHLY ESTIMATES OF CLINKER (UNGROUND PORTLAND CEMENT) PRODUCED AND IN STOCK AT MILLS IN THE UNITED STATES IN 1927, BY DISTRICTS

(In thousands of barrels)

(Preliminary estimates and subject to revision)

PRODUCTION

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Eastern Penn., N. J., and Md.	2,867	2,745	3,394	3,452	3,686	3,692	3,783	3,967	3,792	3,744	3,402	3,051	41,575
New York	455	297	635	895	1,014	1,070	1,165	1,251	1,197	1,128	841	753	10,701
Ohio, Western Penn., and W. Va.	834	719	1,194	1,423	1,523	1,528	1,576	1,689	1,596	1,697	1,631	1,332	16,742
Michigan	799	716	901	1,133	1,364	1,286	1,348	1,352	1,324	1,357	1,243	1,103	13,926
Wis., Ill., Ind., and Ky.	1,337	1,073	1,448	1,710	2,027	1,988	2,026	2,114	2,125	2,164	1,926	1,828	21,766
Va., Tenn., Ala., Ga., Fla.,* and La.†	986	1,068	1,211	1,416	1,439	1.363	1,389	1,434	1,478	1,516	1,431	1,246	15,977
Eastern Mo., Iowa, Minn., and S. Dak.	688	567	796	979	1,287	1,344	1,350	1,486	1,375	1,537	1,383	1,305	14,097
Western Mo., Nebr., Kans., and Okla.	512	284	704	947	1,003	896	858	891	874	1,064	861	733	9,627
Texas	358	395	451	476	488	472	483	462	469	535	516	510	5,615
Colorado, Montana, and Utah	271	168	171	193	161	147	140	169	167	145	121	85	1,938
California	1,074	945	1,143	1,262	1,319	1,343	1,284	1,292	1,215	1,276	1,140	1,038	14,331
Oregon and Washington	229	276	349	360	366	308	295	289	319	306	203	193	3,493
	10,410	9,253	12,397	14,246	15,677	15,437	15,697	16,396	15,931	16,469	14,698	13,177	169,788

STOCKS (END OF MONTH)

Eastern Penn., N. J., and Md.	1,272	1,695	2,129	1,996	1,745	1,407	1,172	974	772	766	877	1,014	.....
New York	469	538	579	580	570	505	426	344	283	281	341	397	.....
Ohio, Western Penn., and W. Va.	1,803	1,663	1,608	1,634	1,611	1,422	1,108	855	667	634	732	1,100	.....
Michigan	954	1,409	1,765	1,850	1,668	1,383	1,280	984	628	440	505	670	.....
Wis., Ill., Ind., and Ky.	1,010	1,635	1,781	1,944	1,793	1,406	1,085	720	385	281	309	539	.....
Va., Tenn., Ala., Ga., Fla.,* and La.†	719	787	816	897	903	870	773	704	727	691	689	788	.....
Eastern Mo., Iowa, Minn., and S. Dak.	680	843	931	942	809	732	592	515	424	408	400	474	.....
Western Mo., Nebr., Kans., and Okla.	673	722	676	669	643	554	457	413	264	231	214	247	.....
Texas	130	134	125	138	169	177	208	180	168	179	176	180	.....
Colorado, Montana, and Utah	707	810	863	846	760	639	540	493	487	454	400	372	.....
California	1,114	1,175	1,143	1,233	1,190	1,233	1,434	1,332	1,348	1,242	1,354	1,491	.....
Oregon and Washington	458	532	581	606	653	598	534	373	337	353	377	395	.....
	9,989	11,943	12,997	13,335	12,514	10,926	9,609	7,887	6,490	5,960	‡6,374	7,667	.....

*Began producing September and shipping October, 1927. †Began producing June and shipping July, 1927. ‡Revised.

SUMMARY OF MONTHLY ESTIMATES OF PRODUCTION AND SHIPMENTS OF FINISHED PORTLAND CEMENT IN 1927, BY DISTRICTS
(In thousands of barrels)

PRODUCTION
(Preliminary estimates and subject to revision)

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	1927	1926
Eastern Penn., N. J. and Md.	2,519	2,353	2,997	3,640	4,040	4,091	4,090	4,255	4,058	3,799	3,345	2,941	42,119	42,139
New York	318	229	597	898	1,033	1,148	1,258	1,348	1,273	1,143	804	701	10,750	8,796
Ohio, Western Penn. & W. Va.	563	865	1,262	1,409	1,558	1,716	1,909	1,967	1,804	1,746	1,542	970	17,311	15,914
Michigan	448	263	551	1,056	1,558	1,580	1,460	1,661	1,692	1,557	1,181	952	13,959	12,037
Wis., Ill., Ind. and Ky.	923	450	1,308	1,552	2,189	2,387	2,360	2,492	2,472	2,280	1,909	1,605	21,927	21,350
Va., Tenn., Ala. Ga., Fla.* and La.†	899	1,020	1,201	1,354	1,456	1,414	1,504	1,522	1,471	1,567	1,452	1,162	16,022	15,308
Eastern Mo., Iowa, Minn. and S. Dak.	509	404	714	982	1,440	1,467	1,509	1,585	1,481	1,572	1,411	1,247	14,321	14,139
Western Mo., Neb., Kans. and Okla.	468	236	753	964	1,037	994	964	943	1,033	1,109	883	713	10,097	10,277
Texas	383	396	465	469	462	469	458	496	487	532	525	514	5,656	5,007
Colorado, Montana and Utah	121	65	118	210	246	268	239	216	174	187	176	113	2,133	2,524
California	974	888	1,179	1,177	1,364	1,322	1,264	1,399	1,200	1,388	1,048	902	14,105	13,842
Oregon and Washington	142	208	305	337	318	368	393	431	360	294	173	179	3,508	3,197
	8,258	7,377	11,450	14,048	16,701	17,224	17,408	18,315	17,505	17,174	14,449	11,999	171,908	164,530

SHIPMENTS

Eastern Penn., N. J. and Md.	1,422	1,708	3,081	4,163	4,139	4,745	4,237	4,484	4,596	3,924	3,008	1,671	41,178	40,636
New York	165	215	481	843	961	1,307	1,263	1,514	1,468	1,171	741	402	10,530	8,536
Ohio, Western Penn. and W. Va.	420	543	932	1,301	1,538	2,162	2,056	2,489	2,352	1,964	986	445	17,188	15,759
Michigan	261	334	596	963	1,431	1,804	1,674	2,146	1,869	1,560	757	317	13,712	11,959
Wis., Ill., Ind. & Ky.	464	652	1,198	1,623	2,336	3,086	2,935	3,119	2,564	2,579	1,284	544	22,384	21,877
Va., Tenn., Ala., Ga., Fla.* and La.†	921	992	1,220	1,385	1,453	1,357	1,465	1,628	1,490	1,505	1,325	786	15,528	14,963
Eastern Mo., Iowa, Minn. and S. Dak.	247	362	729	977	1,383	1,927	1,931	2,267	2,014	1,811	677	240	14,565	14,026
Western Mo., Neb., Kans. & Okla.	398	527	725	791	1,070	976	1,035	1,149	1,187	1,208	830	357	10,253	10,159
Texas	365	382	492	491	573	454	472	561	466	535	543	358	5,692	5,042
Colorado, Montana and Utah	77	101	138	194	229	233	254	293	249	258	175	63	2,264	2,457
California	1,088	736	1,195	1,263	1,423	1,294	1,241	1,306	1,214	1,268	1,103	890	14,021	13,660
Oregon and Washington	140	179	313	356	329	416	421	455	359	322	190	127	3,607	3,113
	5,968	6,731	11,100	14,350	16,865	19,761	18,984	21,411	19,828	18,105	11,619	6,200	170,922	162,187

*Began producing September and shipping October, 1927. †Began producing June and shipping July, 1927.

SUMMARY OF ESTIMATES OF STOCKS OF FINISHED PORTLAND CEMENT AT END OF EACH MONTH IN 1927, BY DISTRICTS
(In thousands of barrels)
(Preliminary estimates and subject to revision)

District	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Eastern Penn., N. J. and Md.	5,116	5,761	5,677	5,154	5,048	4,394	4,247	4,007	3,494	3,389	3,765	5,034
New York	1,438	1,453	1,568	1,624	1,695	1,536	1,531	1,365	1,170	1,142	1,205	1,504
Ohio, Western Penn. and W. Va.	2,620	2,942	3,272	3,380	3,400	2,953	2,806	2,284	1,735	1,513	2,069	2,595
Michigan	2,093	2,019	1,975	2,068	2,195	1,971	1,743	1,257	1,080	1,077	1,501	2,136
Wis., Ill., Ind. and Ky.	3,441	3,239	3,348	3,277	3,131	2,432	1,857	1,231	1,139	885	1,512	2,573
Va., Tenn., Ala., Ga., Fla.* and La.†	1,167	1,197	1,178	1,144	1,146	1,206	1,251	1,145	1,126	1,178	1,304	1,680
Eastern Mo., Iowa, Minn. and S. Dak.	3,199	3,241	3,226	3,231	3,289	2,841	2,419	1,737	1,204	991	1,724	2,731
Western Mo., Neb., Kans. and Okla.	1,847	1,556	1,584	1,756	1,725	1,743	1,672	1,466	1,314	1,213	1,265	1,622
Texas	461	475	448	425	314	330	316	251	272	270	252	407
Colorado, Montana and Utah	518	482	470	486	515	541	531	458	384	313	315	365
California	551	707	692	629	573	601	624	718	704	824	776	788
Oregon and Washington	463	491	484	480	472	424	400	373	374	346	334	386
	22,914	23,563	23,922	23,654	23,503	20,972	19,397	16,292	13,996	13,141	16,022	21,821

*Began producing September and shipping October, 1927. †Began producing June and shipping July, 1927.

Sales of Lime in 1927

THE LIME sold by producers in the United States in 1927 amounted to 4,337,000 short tons, valued at $38,210,000, according to estimates furnished by lime manufacturers to the United States Bureau of Mines, Department of Commerce. This is a decrease of 5% in quantity and 8% in value as compared with sales in 1926. The sales of hydrated lime, which are included in these figures, amounted to 1,562,000 tons, valued at $14,300,000, a decrease of 3% in quantity and 6% in value. The average unit value of all lime showed a decrease from $9.11 a ton in 1926 to $8.81 in 1927, and that of hydrated lime a decrease from $9.45 a ton in 1926 to $9.15 in 1927.

Conditions in the lime industry during 1927 were reported as unsettled and unsatisfactory, especially for the last six months of the year. Demand for building, chemical and agricultural lime was irregular, and although in general it was reported as less or the same as in 1926, there were many reports of good or increased demand.

Sales of lime for building in 1927 are estimated at 2,200,000 tons; for chemical uses, 1,847,000 tons; for agriculture, 290,000 tons.

Ohio, the leading state, showed a decrease of 7% in total quantity of sales and 8% in sales of hydrated lime. Pennsylvania, which ranked second, showed a decrease of 2% in total sales. Of the 23 states selling more than 25,000 tons, eight showed increased sales.

Sales of deadburned dolomite for refractory use were estimated at 370,000 tons, valued at $3,316,000, a decrease of 4% in quantity.

The accompanying table compares the estimated sales of lime by the producers in 1927, by states, with the sales in 1926.

LIME SOLD BY THE PRODUCERS IN THE UNITED STATES IN 1926 AND 1927

State	1926 Hydrated lime Short tons	1926 Total lime Short tons	1926 Total lime Value	1927 (estimated) Hydrated lime Short tons	1927 (estimated) Total lime Short tons	1927 (estimated) Total lime Value
Ohio	752,764	1,056,589	$10,348,380	690,000	978,000	$ 9,445,000
Pennsylvania	237,066	794,196	6,303,312	258,000	780,000	5,800,000
Missouri	83,451	263,467	2,218,943	91,000	274,000	2,295,000
West Virginia	42,164	267,464	1,719,590	36,000	250,000	1,576,000
Alabama	29,791	220,732	1,721,558	26,000	208,000	1,589,000
Wisconsin	15,458	216,414	1,896,772	14,000	196,000	1,680,000
Massachusetts	19,005	202,065	2,653,746	20,400	181,000	2,322,000
Tennessee	52,190	173,363	1,319,303	50,000	176,000	1,261,000
Virginia	62,191	188,696	1,453,095	63,000	172,000	1,250,000
Illinois	26,549	103,180	1,013,740	32,000	117,000	1,130,000
Maine	*	128,120	1,615,776	22,000	116,000	1,364,000
Indiana	46,332	126,005	970,624	45,000	107,000	778,000
Michigan	15,468	107,671	995,123	17,000	100,000	942,000
New York	36,193	107,326	1,016,647	36,000	97,000	923,000
Texas	33,443	78,293	706,153	34,000	79,000	709,000
California	9,294	67,421	800,089	*	65,000	774,000
Maryland	36,624	63,639	524,242	28,000	58,000	421,000
Vermont	9,731	56,378	677,944	9,600	57,000	557,000
Connecticut	*	61,742	695,495	*	53,000	602,000
Arizona	*	42,757	421,549	*	47,000	455,000
Arkansas	*	31,346	275,935	*	35,000	322,000
Minnesota	*	28,522	296,068	*	*	*
Washington	*	23,783	298,014	*	27,000	320,000
Undistributed	99,097	151,229	1,623,854	90,000	164,000	1,695,000
	1,606,811	4,560,398	$41,566,452	1,562,000	4,337,000	$38,210,000

*Included under "Undistributed."

Canadian Exports of Asbestos

CANADA exported asbestos and asbestos products to the value of $10,801,645 during the year 1927, which was an increase of approximately $100,000 over the exports for 1926. During the month of December the value of the exports was $986,524, of which more than half was shipped to the United States. Germany was the second largest importer, receiving $183,385 of December export.

Broken Stone Cost Data Suggestions*

Suitable System of Cost Keeping the Best Guide to Efficient and Profitable Operation

Dr. George E. Ladd
United States Bureau of Public Roads

AN EDITORIAL in a recent issue of the *Saturday Evening Post* refers to and criticises a U. S. Treasury report which calls attention to losses incurred in various lines of industry. Referring to this editorial, this statement is drawn:

"The worst showing was made in mining and quarrying where more than 70% of the reported incorporations indicated losses."

The above statement is based on mere numbers of individual units, and it is to be hoped that the larger units, as represented by membership in the National Crushed Stone Association are outside of this great casualty list.

The suggestions which I have to offer to your association are confined wholly to the field of plant operations. If there is anything of value in what is offered, it is an easy matter for any operator to apply it to the more private matter of his overhead costs.

Factors Affecting Profits

The making of a profit in this industry does not lie *wholly* (I emphasize that word), in the economics of large scale operations. It may be dependent upon many factors—particularly the character and physical condition of the beds of stone or ledge which are quarried. Certainly under any circumstances, efficiency of operation is a vital factor, but there are many aspects to this word efficiency. Efficiency may be evident in some respects. Methods of operation must be adapted to given physical conditions involving the nature of rocks to be quarried, topography, and location, especially with reference to immediate surroundings, which for example may limit the magnitude of blasting operations. The layout must be economical. The lowest-cost available power must be used. Equipment best suited to the particular problem must be selected. The kind of explosive used and the spacing of drill holes must be properly related and both of them adapted to the nature and physical condition of the rock to be quarried, and the results obtained must also solve the boulder problem, with reference to size and quantity. Where many boulders must be broken, the cheapest method must be found and a proper relationship established that is most economical, between boulder reduction, the size and character of loading shovel, delivery apparatus, and the size of initial crusher. Supervising employees must be capable and loyal, labor must be handled intelligently.

How may a proprietor know whether or not in all respects his plant is being operated with maximum efficiency? Is he static and satisfied with existing methods and conditions at his plant, or is he dynamic and anxious for the ultimate in perfection, or as near an approach to it as practically attainable?

Suitable Cost Keeping a Guide to Efficiency

Bookkeeping and balance sheets throw no light on efficiency, but cost keeping *will* do so if a suitable and simple system be adopted, and if it be conducted by an employee who is both intelligent and conscientious. It has fallen to my lot to study quarry operation at various times from different points of view. Years ago I made extensive quarry studies for the states of Missouri and Massachusetts, and, after the war, prepared for the United States Bureau of Public Roads a bulletin entitled "Direct Production Costs of Broken Stone," which was published a short time ago. In that bulletin lies the answers to most of the important production problems of the broken stone manufacturer, or at least, the way is pointed to their solution, if he has the patience to dig it out. So much of value to the broken stone industry has been suggested to me by the facts contained in this publication, that it has been my hope to find time for another bulletin covering the lessons indicated by the work already done.

If careful study is given to the tables and accompanying data already published, it is evident that something more important than the presentation of direct operating costs at certain selected quarries, was achieved. To me at least it is evident that the question of EFFICIENCY is brought out in nearly every detail of the report.

Of the 23 quarries studied all but 2 were under my personal observation for several summer periods. Observation was made of all the factors affecting efficiency of operation, together with a comparative study of methods, layout, equipment, physical conditions, labor conditions and management. Nothing ever interested me more than the question of whether or not the ultimately obtained period-cost data would bear out general observations made and vindicate the opinion formed at various plants as to their efficiency factors.

Let me state at once that whatever praise or condemnation I had mentally awarded to any phase of plant operations was proved to be justified when daily reports had been assembled into weekly reports, and weekly reports into final reports for the periods of study. The cost data investigation conducted along lines of natural units of operation turned out to be an efficiency study. Doubtless any one of you would have known that it would be so. To me it was a pleasing revelation and all the more so because it testified to the accuracy of our field work and compilations.

Direct Cost Study

In order to make clear various subject-references, let me refer to the plan I adopted for my direct cost study, which seems to have been practical, simple and easily carried out.

As originally made, unit operations were selected as follows:

1. Stripping.
2. Breaking face.
3. Breaking boulders (all methods).
4. Pumping.
5. Loading and hauling waste.
6. Loading and delivery to crusher.
7. Crushing and screenings.

It was quickly found desirable to further sudvidide these units, especially for a study which included numerous small-scale plants. The item, Breaking Face was sub-divided into the two units,—Drilling Face and Blasting Face; Breaking Boulders was sub-divided into—Drilling Boulders, Blasting Boulders and Sledging. Loading and Delivery to Crusher were made separate units, so that the natural units on which cost-data was obtained, were finally as follows:

1. Stripping.
2. Drilling face.
3. Drilling boulders.
4. Blasting face.
5. Blasting boulders.

*Paper delivered at West Baden, Ind., convention of the National Crushed Stone Association.

6. Sledging.
7. Pumping.
8. Loading and hauling waste.
9. Loading and delivery to crusher. (Details and Summary separately kept.)
10. Crushing, Screening, etc.

At quarries where steel-balling was practiced for the reduction of boulders, wholly or in part, a special study was made of that phase of operation.

Of course, all quarries do not need this complete list. Some may have no stripping to do; no loading and hauling or waste; no pumping; no sledging; and probably no breaking of boulders by the steel-ball method.

Selection of Recording Forms

The selection of good forms for the recording of daily, weekly and final data was important and several were tried and rejected, before satisfactory ones were adopted. They include those for daily records, and for weekly and final assembly sheets, for each unit separately, and for all, collectively. Forms covering drill sharpening and rate of drilling were also used. Notes were kept on equipment and its condition and many phases of work were studied, down to the timing of laborers on various operations.

Some of the facts demonstrated by figures are as follows:—

1. Power costs were lowest where electricity was used.

2. Machine drill-sharpening led to lower cost and greater efficiency.

With one exception, well-drilling, with drill operated by any form of power generation, resulted in the cheapest method of breaking face. The exception is where quarries were located in highly jointed trap rock and had especially high faces. In general it was true—the higher the face blasted, the lower the cost of face-breaking.

Drilling Costs

In the case of two quarries which were studied in two consecutive seasons, the cost results were informative. During the first study one of them used well drills until stopped by injunction. They continued with tripod work, so that all the second year's drilling was by tripod. The cost of face drilling per ton of stone produced increased the second year by 15 cents. At the second quarry similar circumstances occurred, with a resulting increase of face-breaking cost of over 16 cents per ton of broken stone. In fact, the cost of breaking face, where tripod-drilling replaced well-drilling, was exactly doubled. Where a good face was not left after blasting, especially where toes were left, the results showed up in face-blasting and face-drilling costs. In cases where an excessive amount of boulders resulted from poor blasting method, that is, improper explosive used, or poor spacing of holes, the error fairly cried out when cost data for face-breaking units were consulted. Where hand labor was used for loading, and this was the case in part of two large-capacity plants, contract labor was more efficient in tons-loaded-per-hour, in the ratio of approximately three to two. Relative costs, of course, depended upon contract prices and labor wages.

It was found that cost of face-drilling, and the rate-drilled per hour, varied directly with "percentage of wear tests" made in our laboratory.

An important revelation was that a quarry which was studied in two consecutive years completely altered its plant-layout preceding the second study, and its direct operating costs were lowered almost exactly 50% by the change!

Unit Costs Reveal Conditions

A comparative study of costs and conditions at four plants having a daily capacity of about 2,000 tons, shows the following total direct operating costs per ton, respectively: $0.4242; $0.2828; $0.3471; $0.3130.

The highest cost in this group was at a plant where a part of the stone produced was from a pit, and a part of loading was done by both day labor and contract labor. Also in blasting it produced three times as many boulders for subsequent reduction, as were produced at the other plants. The next to the highest-cost plant used steam power instead of electricity at its crushing plant, and was of the pit type so that delivery to crusher involved hoisting and extra expense. The unit costs in each case coincided with conditions.

The above statements show clearly enough how satisfactorily unit costs enable an owner to see at once where trouble lies if there be trouble. Perhaps it can be remedied and perhaps not. At least the facts are worth knowing and certainly in many cases they should lead to a checking up or alteration of method.

It seems evident that if a group of plant owners could conduct a natural-unit system of keeping direct operating costs for a year or two, they could exchange results to the mutual advantage of all concerned, or if they chose, give valuable information to the industry at large. To make a useful study, conditions at each plant should be described.

Significance of Cost Data

In order to emphasize the significance of data obtained through correct keeping of natural unit direct production costs, let me call your attention to a few comparisons made in different units as between plants operating each at approximately 2000 tons per day, and in practically the same kind of stone. At one of them drilling-face costs were 3¾ cents per ton of broken stone produced and at the other only 2¾ cents. Assuming operation for 300 days in the year this slight per ton difference amounts to the sum of $6,000 per year.

The cost of blasting a face at one quarry was $0.0616 per ton and at the other $0.0441, a difference of 1¾ cents or for the year's operation a sum of $10,500. One of these quarries spent 7¾ cents more per ton of broken stone produced than the other for the unit,—boulder breaking. The difference in cost for the year's operation for this unit amounts to $46,500.

Suppose that neighboring quarries operating under similar circumstances discovered such discrepancies in cost, and through the unit system could tell just where the difference occurred. Then when you saw for example the item of $46,500 showed up wouldn't it pay to look at once into the boulder proposition and see first whether the drilling and blasting methods were properly adapted to the work, and, second, whether or not breaking of boulders was carried on as cheaply as possible?

Steam vs. Electric Power

In regard to saving, as between the use of steam power and electricity, two plants owned and operated by the same company and in the same kind of rock, used, for crushing and screening plants, steam and electricity respectively. At the steam-operated plant crushing and screening costs were $0.1013 per ton of product and at the plant where electricity was used the cost per ton was $0.0630. Here was a difference in cost of nearly four cents per ton. The saving at the electrically operated crushing and screening plant amounted, in round figures, to $23,000 per year. Of course, ultimate costs per ton, as between the two methods, depend upon fuel cost and the cost per unit of electric power. However, in all cases studied, the advantage lays in electric power.

In this connection it should be borne in mind that relative cost per horsepower is not a dependable guide for a selection of method. In a study of southern cotton mill cost it was found that steam per horsepower costs less than electricity per horsepower, but that *under operating conditions* the cost *per horsepower consumed,* in production, was decisively in favor of electricity.

By keeping records in terms of labor hours as well as simply labor cost, the whole labor situation becomes illuminated, as does, also, perhaps, the question of the ability and loyalty of foremen.

In this brief discussion I have tried only to demonstate that direct production costs kept on a natural unit basis must be of great advantage, in dollars and cents, to broken stone producers individually and collectively, and, I may add, through inference, in the great satisfaction of doing a job as well as possible.

New York State Sand and Gravel Producers Hold Annual Convention

Rochester Meeting Well Attended—Excellent Papers on Many Subjects Are Presented

THE SECOND ANNUAL convention of the Empire State Sand and Gravel Producers Association, held at Rochester, January 24, proved the most successful affair the association has ever held. The sessions were held at the Chamber of Commerce during the day and the closing session followed a dinner at the Rochester Club in the evening, at which prominent state and city officials were guests.

John G. Carpenter

Members and guests who attended the various sessions numbered nearly one hundred and included David Noonan, deputy commissioner of highways of the state of New York; Stephen B. Storey, city manager of the city of Rochester; Harold Baker, commissioner of public works of the city of Rochester, and Stanton Walker, director of research, National Sand and Gravel Association, Washington, D. C.

The association, organized at Syracuse, January 8, 1926, has an active membership of about 35 and is growing in numbers and interest. Firms selling machinery and equipment to the industry are admitted as associate members.

Secretary's Report

The business session was held at eleven in the morning. President G. K. Smith of Albany was unable to attend on account of sickness and John A. Taylor of the Valley Sand and Gravel Corp. was made chairman. In his report, Secretary-Treasurer John G. Carpenter enumerated a long list of activities including distribution of literature among architects, highway officials and cement products manufacturers, efforts to extend the use of No. 1 gravel, enlisted co-operation of other associations in movement for uniform inspection of aggregates by the state, enlisting the active aid of the chambers of commerce in various cities in the impending general freight rate revision, and stated that three meetings had been held during the year, seven bulletins had been distributed to producers, and that he had visited about half of the plants in the state and assisted many producers in solving individual problems. As treasurer he reported that he had expended only about half of the income and that the association now had nearly $400 in money and property.

The policy of the association on several lines of activity was discussed and referred to the executive committee. There was an inclination to limit membership to producers who expressed an active interest in the association and maintained a high standard of production. The following officers were elected: President, David Hyman, of the Buffalo Gravel Corp.; vice-president, Henry F. Marsh, of the Consolidated Materials Corp., Rochester; secretary-treasurer, John G. Carpenter, of Madison Sand and Gravel Corp., Hamilton, N. Y. The executive committee will comprise the above officers and two others to be appointed by the president.

The afternoon session opened with a luncheon given by the Valley Sand and Gravel Corp. and the Consolidated Materials Corp., and in the absence of the president the program which followed was in charge of Secretary-Treasurer John G. Carpenter.

Operating and Rate Problems

H. A. Stelley of the Buffalo Gravel Corp. spoke on "Dredging Bank Gravel," illustrating his subject by describing the dredging plant which he built for the Valley Sand and Gravel Corp. in 1926 near Rochester and heartily recommended the method where conditions were favorable.

"The Clarence Rate Case" was the subject of E. W. Gumaer, attorney, Rochester. In the winter of 1927 the West Shore R. R. published a rate of 40 cents per ton on sand and gravel from Clarence to Buffalo, a distance of about 16 miles, when the lowest other rates into Buffalo were 65 cents. Mr. Gumaer represented one of the competing roads on the hearing and he explained the issues in the case and that a decision was expected soon.

"Uniform State Inspection of Aggregates" was treated by John G. Carpenter, president of Madison Sand and Gravel Corp. Mr. Carpenter explained the system of inspection in use in several other states, stating that as chairman of the association committee he was trying with apparent success to secure the co-operation of the New York State Crushed Stone Association and the New York Highway Chapter in suggesting a tentative plan to the New York Highway Department, and that Commissioner Brandt has already been interviewed. He expressed the view that a simple and conservative plan would soon be submitted to the Highway Department.

"Uniform Freight Rates on a Mileage Basis," an address by F. W. Burton, manager of transportation bureau of the Rochester Chamber of Commerce, created attention. He pointed out the wide variance in mileage tariffs now in force and predicted a general revision in the near future. He promised active aid to the sand and gravel interests when the break occurs.

Super-Highways

Hon. David Noonan, deputy commissioner of highways of the state of New York, spoke on "The Demand for Super-Highways" and gave a wonderfully complete exposition of the road problems of the Empire State and how the department was meeting them. He used an unpublished work map of the main arteries of traffic to illustrate his points. The main trunk lines contemplated for the next decade include concrete roads on either side of the Hudson river from New York to Albany, one of them leading from Albany to Buffalo through rural districts in nearly a straight line and the other running a little north through Utica, Syracuse and Rochester to Buffalo. These roads will have a minimum width of 27 ft. and in congested districts will have a width of from 40 to 60 ft. as the traffic demands. Other short super-highways will extend from Niagara Falls toward Erie, Penn., through Long Island, from Albany north, and from New York toward the state of Connecticut.

At this point Mr. Carpenter called on J. E. Bowker of the Birnie Sand and Gravel Co., Springfield, Mass., the long distance traveler of the convention. He expressed his pleasure in the opportunity to attend and complimented the association on its activity.

"Quality of Aggregates and the National Association" was the subject treated on by Stanton Walker, director of research, National Sand and Gravel Association. He explained the importance of quality aggregates and how the national association was promoting their production and use. Mr. Walker pointed out the value of engineering service and gave examples of the service of this kind that had been rendered. An interesting feature of his appearance was the general discussion of questions asked by members.

Notables at Dinner

The dinner held at the Rochester Club at 6:30 p. m. was attended by practically all the visitors and proved a most enjoyable and instructive affair. John G. Carpenter, secretary-treasurer of the association, presided and at the speakers' table were Stephen B. Storey, city manager of the city of Rochester; Harold Baker, commissioner of public works; Henry L. Howe, Jr., engineer of designing and construction of the city of Rochester; Stanton Walker, engineer and director of research of the National Sand and Gravel Association; George E. Schaefer, President of the New York State Crushed Stone Association, and J. F. Ancona, engineer on concrete construction of the city of Rochester. On account of sickness and transfers to the afternoon program, the formal addresses of the evening were reduced to three, but these were supplemented by short and snappy talks by City Manager Storey and Commissioner of Public Works Baker. Letters of regret from Hon. Arthur W. Brandt, commissioner of highways of the state of New York; Senator Charles D. Newton, former attorney general of the state of New York; Hon. H. S. Sisson, former state commissioner of highways, and Hon. Charles Cadle, former state engineer, were read.

"Aggregates in City Construction" was ably presented by Henry L. Howe, Jr., city engineer of the city of Rochester. He outlined the growth of the demand for better aggregates, explained the work of the city research laboratory and stated that the city is always alert to secure the best aggregates available.

Co-operation with Crushed-Stone Producers Asked

"Our Common Interests" was discussed by George E. Schaefer of the General Crushed Stone Corp. and president of the New York Crushed Stone Association, in an interesting manner. He brought a message of good will from the crushed stone producers and mentioned uniform state inspection, freight rates, cleaning and repairing cars, maintenance of quality of aggregates, and honorable competition as problems subject to joint action of the associations. He expressed the hope that the spirit of friendly co-operation that had just begun between the associations would continue with ever increasing interest.

"Research and Specification Problems of Sand and Gravel Producers" was treated by Stanton Walker in a clear and concise manner. He stated that many of the problems were of a technical nature and required the service of an engineer. He explained how the national association was solving those problems and cited the work in securing standardized specifications and similar activities. He advised the producers to keep in touch with research agencies and explained to them how reports of research work could be procured. For a moment he yielded the floor to George E. Schaefer, who stated that the funds for a research laboratory for the National Crushed Stone Association were assured and earnestly urged that sand and gravel producers get behind their movement for a research laboratory.

Registration

The following is a partial list of those who attended the convention:

C. A. Adams, Madison Sand and Gravel Corp., Solsville, N. Y.; L. M. Beattie, Valley Sand and Gravel Corp., Rochester, N. Y.; R. C. Brotsch, Consolidated Materials Corp., Rochester, N. Y.; J. E. Bowker, Bernie Sand and Gravel Co., North Wilbraham, Mass.; Harold W. Baker, Commissioner of Public Works, Rochester, N. Y.; J. F. Ancona, engineer on concrete construction in the city of Rochester; F. W. Burton, Chamber of Commerce Traffic Bureau, Rochester, N. Y.; Fred R. Beemish, Department of Public Works, city of Rochester, N. Y.; H. W. Butler, Whitmore, Rauber & Vicinus, Rochester, N. Y.; John G. Carpenter, Madison Sand and Gravel Corp., Hamilton, N. Y.; D. G. Craig, Consolidated Materials Corp., Rochester, N. Y.; J. Colby Carpenter, Madison Sand and Gravel Corp., Hamilton, N. Y.; E. G. Cole, Democrat and Chronicle, Rochester, N. Y.; C. A. Dakin, Miller Equipment Co., Rochester, N. Y.; George F. Eagen, Rome Cast Stone Co., Rome, N. Y.; H. J. Elam, Elam Sand and Gravel Co., Rochester, N. Y.; D. L. Evans, Rome Cast Stone Co., Rome, N. Y.; F. H. Elam, Elam Sand and Gravel Co., Rochester, N. Y.; E. B. Foote, Consolidated Materials Corp., Rochester, N. Y.; W. A. Flynn, Valley Sand and Gravel Corp., Rochester, N. Y.; Ben J. Fisher, New Jersey Wire Cloth Co., New York City; J. P. Fogarty, Barber-Green Co., Utica, N. Y.; Raymond C. Fox, Newport Sand and Gravel Co., Rochester, N. Y.; F. C. Facer, State Highway Department, Rochester, N. Y.; W. J. Gilmore, Valley Sand and Gravel Corp., Rochester, N. Y.; Samuel A. Gilliard, Barber-Greene Co., Buffalo, N. Y.; E. W. Gumaer, Havens, Strang, Mann & Whipple, Rochester, N. Y.; Max Greenberg, Department of Public Works, Rochester, N. Y.; Henry L. Howe, Jr., Department of Public Works, Rochester, N. Y.; J. Shuman Hower, Hower Machinery Agency, Utica, N. Y.; H. Walter Hughes, Department of Public Works, Rochester, N. Y.; James E. Kelley, State Highway Department, Rochester, N. Y.; B. C. Lucas, Valley Sand and Gravel Corp., Avon, N. Y.; Gregory J. Love, Whitmore, Rauber & Vicinus, Rochester, N. Y.; John P. Larsen, State Highway Department, Rochester, N. Y.; John V. Lewis, Department of Public Works, Rochester, N. Y.; H. F. Marsh, Consolidated Materials Corp., Rochester, N. Y.; H. L. Michaels, State Highway Department, Rochester, N. Y.; W. A. Margrander, Newport Sand and Gravel Co., Rochester, N. Y.; Edwin A. Miller, Department of Public Works, Rochester, N. Y.; E. R. Morairty, Department of Public Works, Rochester, N. Y.; V. J. Milkowski, Morris Machine Works, Baldwinsville, N. Y.; George Miller, State Highway Department, Rochester, N. Y.; H. R. Moultrop, Department of Public Works, Rochester, N. Y.; Herbert L. Michael, State Highway Department, Rochester, N. Y.; Henry L. Marsh, Consolidated Materials Corp., Rochester, N. Y.; David Noonan, Deputy State Commissioner of Highways, Albany, N. Y.; J. R. Norton, Smith Engineering Works, New York City; Carlton Oaks, Nathan Oaks & Sons, Oaks Corners, N. Y.; E. L. Oliver, Department of Public Works, Rochester, N. Y.; John A. O'Connor, Department of Public Works, Rochester, N. Y.; M. M. Reynolds, Reynolds Sand and Gravel Co., Ithaca, N. Y.; E. T. Rope, Department of Public Works, Rochester, N. Y.; Alexander Russell, Rochester and Lake Ontario Water Co., Rochester, N. Y.; F. T. Buchenberger, Department of Public Works, Rochester, N. Y.; Jay W. Robinson, Eldridge & Robinson, Auburn, N. Y.; A. W. Rogers, Consolidated Materials Corp., Rochester, N. Y.; Ralph Richardson, Haverstick & Co., Rochester, N. Y.; Stephen B. Storey, City Manager of Rochester, Rochester, N. Y.; H. A. Stelley, Buffalo Gravel Corp., Buffalo, N. Y.; George E. Schaefer, New York State Crushed Stone Assn., Rochester, N. Y.; Edw. G. Stallman, Valley Sand and Gravel Corp., Rochester, N. Y.; John A. Taylor, Valley Sand and Gravel Corp., Rochester, N. Y.; E. M. Van Gilder, Deppartment of Public Works, Rochester, N. Y.; H. A. Walter, East Aurora Sand and Gravel Corp., Buffalo, N. Y.; Stanton Walker, National Sand and Gravel Assn., Washington, D. C.; George C. Wright, Manroe County Superintendent of Highways, Rochester, N. Y.; Albert Wood, Bennett and Wood, Rochester, N. Y.; F. J. Weider, Barr and Crealman, Rochester, N. Y.

Wisconsin Rock Products Men Receive First-Aid Training

ARRANGEMENTS have been made by the Industrial Commission of Wisconsin whereby first-aid will be demonstrated by the U. S. Bureau of Mines in ten Wisconsin cities. The course of training is offered to quarrymen, gravel pit men, highway workers and contractors. The first meeting started on Tuesday, January 24, at Eau Claire, and the second opened on January 31 at La Crosse. The remaining classes will commence on successive Tuesday afternoons, from February 7 on, at Ableman, Janesville, Milwaukee, Sheboygan, Manitowoc, Green Bay, Wausau and Red Granite, in the order named. All of the classes will start at 1:30 on the date indicated and last for 2½ days. The course is the regular one given by the Bureau of Mines and a certificate is issued to those taking the work. Employers are urged to have at least two men from each operation present.

Southwest Road Show To Be Held at Wichita

PREPARATIONS are now being made for the third annual Southwest Road Show and School to be held at Wichita, Kan., on February 21 to 24. The exposition will be sponsored by the Wichita Thresher and Tractor Club, and will be placed in the large exposition building of that city. It is stated that applications for space at the exhibition have already been so great that it is probable that an overflow space will be necessary. The federal government will have an extensive exhibit at the show, as will a number of state highway departments, and most of the leading manufacturers. A large attendance is expected since the territory covered by the show includes 14 different states.

Contractors' Rock Asphalt Co. Organized at Birmingham

A NEW company, the Contractors' Rock Rock Asphalt Co., has recently been organized at Birmingham, Ala., to develop rock asphalt deposits in Alabama. The concern has been incorporated for $275,000. It is planned to open and operate asphalt deposits near Florence, Ala., where it is expected that the development will require an outlay of approximately $75,000. John Wills of 913 South 40th street, Birmingham, is at the head of the new company.—*Iron Age.*

Robert Bentley

ROBERT BENTLEY, 74, former president of the Carbon Limestone Co., Youngstown, Ohio, died on January 21 following a long illness. Mr. Bentley had been active in a number of fields in Youngstown until the time of his illness, having served as president of the Ohio Iron and Steel Co., Interstate Limestone Co. and Ohio and Pennsylvania Belt Railway, as well as carrying on his work as president of the Carbon company. Mr. Bentley was a well-known figure at many of the crushed stone conventions in past years which he attended until illness kept him from the gatherings.

Iowa Sand, Gravel and Stone Producers in One Association

Iowa City Meeting Discusses Some Live Subjects in Regard to State Highway Work

THE IOWA AGGREGATE ASSOCIATION, consisting of sand and gravel and crushed stone producers, held its first annual meeting in Iowa City, Iowa, January 26. The association is young, the first meeting having been held in Cedar Rapids about three months ago. Twenty-six producers were present, which, as the state contains only 44 companies considered as eligible, is a fair showing. Not all who attended were members, but several joined during the session.

Three things came before the meeting and were the subject of some lively discussion. The first was the question of better contact with the state highway department, the second the aggregate survey that the state is making and the third, the cement company stone situation. This last is a matter that is of more than local interest and it has been brought before the National Sand and Gravel and the National Crushed Stone associations.

The Crushed Stone Situation in Iowa

It seems to be well proven that a large part of the crushed-stone business of the state is being done by two or three companies which manufacture cement and find their principal market for cement in the state. The sense of the meeting seemed to be that there was no objection to a cement company going into the stone business, provided it kept its two lines separate. But if it were to sell stone at a more favorable price than regular producers cared to sell it, as a means of inducing a contractor to buy its cement, it would work a hardship on both the crushed stone industry of the state and such cement manufacturers as were not in the stone business. Some dealers in other brands of cement feel that they have been injured in this way. The whole matter was placed in the hands of a committee which will be appointed by the president and is to confer with committees from the national organizations of aggregate producers and committees from other organizations.

R. C. Fletcher, who is president of the National Sand and Gravel Association, reported that he has attended the crushed stone convention at West Baden and laid the cement-stone situation before it.

Regarding contacts with the highway department and highway engineers throughout the state, the producers feel that they are not so well thought of as the contractors and the manufacturers of some other supplies who have strong organizations behind them. The recent rise in the price of crushed stone has been characterized as taking advantage of a situation, and the producers resent this and feel that their side of the case has not been adequately presented.

In order to understand this one must remember that the producers of aggregates in Iowa have had a bad market and unsatisfactory business conditions to contend with for the past few years. This was brought about by the rapid fall in the price of farm land and the long period of depressed prices for farm products. In this time it was a struggle for many of them to keep in business at all, and prices were lowered in many cases to where they barely covered direct production costs, leaving nothing for such overhead charges as depletion, depreciation and interest on invested capital. Now many counties have recently voted bond issues, and the state will undoubtedly pass a bond issue, so that the market has improved and a still better market is in sight, and the producers feel that it is no more than right that they should have a price which would cover the indirect as well as the direct production costs. As an example of what comes to the producer who cannot sell at a price to cover all costs, one producer told the writer of a going concern that had invested $180,000 in plant and equipment that sold out recently for only $35,000. With an improved market and a fair price the new owners are in a position to make money. The producers point out that, even with the advance in price, crushed stone sells for less money in Iowa than in many other parts of the United States.

Aggregate Survey to Be Made

The aggregate survey of Iowa is to be made by the Agricultural and Industrial Commission of the state and is to be made by the governor's orders. The Iowa Aggregate Association expressed its willingness to co-operate by furnishing data of potential plant capacities, the amount of tonnage which will be absorbed by other than highway construction and the amount of capital invested in plants. To obtain these data the meeting instructed the secretary to send questionnaires to members and other producers.

It was voted that the president appoint committees to consider ways and means of making better contacts with highway authorities and to assist in the aggregate survey.

The matter of a uniform contract form was considered and it was voted that all members should send the secretary copies of the forms they used together with suggestions for improvement. These are to be referred to a committee which will draft a form containing all the good points in the forms in use. This draft will then be submitted to all the members for further criticism and later it will be voted upon by the membership.

Aggregate Specifications

At luncheon, Dean Williams of the College of Engineering, Iowa State University, spoke on aggregate specifications. He began by saying that too many specifications were mere copies which engineers had made from text books and specifications made for other localities without understanding their uses.

He said that there were only two characteristics by which aggregate should be judged (always supposing that aggregates were clean). The first is structural soundness; the piece of aggregate should be as hard and durable as the mortar matrix which surrounded it. Greater hardness was not necessary, only a strength equal to the matrix.

Grading, he explained, has nothing to do with the strength of concrete; it has only to do with the economy of making it. Concrete can be made from almost anything that is structurally sound—provided enough cement is used. It is to make strong and workable concrete with the minimum of cement that grading is chiefly used. All factors in grading are for the sake of economy. Too often engineers forget this and insist on freak gradings, thinking these will somehow make the concrete better.

Of course where the quantity of cement is *fixed* grading becomes all important in determining the strength of concrete. He gave an example to show the truth of this. A trestle and irrigation ditch built in Colorado went to pieces after six months' use. The engineer who had had the job in charge said this was caused by alkali in the ground water. But analysis showed no alkali in the ground, the water or in the concrete so the cause of disintegration was sought in the materials used. Professor Williams found that the engineer had permitted the contractor to screen the sand and gravel from a creek bed through a ¼-in. screen and to use all that remained on the screen as "gravel" and all that passed the screen as "sand" in a 1:2:4 mix. Actually there was so little difference between the "sand" and the "gravel" that 500 volumes of the "gravel" and 250 volumes of the "sand" made 723 volumes. The concrete was really a 1:6 sand mortar. By screening out intermediate sizes, Professor Williams said he made a very good concrete, but at the cost of discarding considerable material.

The association unanimously voted the present officers for the ensuing year. These are:

President, George D. Rose, Dubuque Stone Products Co., Dubuque; vice-president, Gaylord Gray, Des Moines Sand and Fuel Co., Des Moines; secretary-treasurer, Sidney Moore, Builders Material Co., Cedar Rapids. Directors: G. J. Asthalter, Automatic Gravel Products Co., Muscatine; Harry Bellamy, Iowa Sand and Gravel Corp., Oskaloosa; Paul Nauman, Dubuque Stone Products Co.

Standard Lime and Stone Co. Building New Mill

CONSTRUCTION of a new lime grinding mill has been started at Valders in Manitowoc county, Wisconsin, by the Standard Lime and Stone Co. of Fond du Lac, Wis., according to an announcement made recently at the company's annual meeting by Senator William A. Titus, the president. The mill will be completed in about 30 days, Senator Titus said, and the manufacture of ground lime will be started immediately. Construction of the mill is part of an extensive expansion program which the Standard Lime and Stone Co. has undertaken during the last year.

At the annual meeting, all of the old officers and directors were re-elected. The annual reports indicated a successful year in 1927 and good prospects for 1928.—*Fond du Lac* (Wis.) *Reporter.*

East End Sand Co. Bought by Chillicothe Company

THE Chillicothe Sand and Gravel Co., Chillicothe, Ohio, which was recently incorporated for $50,000, has purchased the property of the East End Sand and Gravel Co. of Chillicothe and will operate the plant. It is understood that the amount paid for the East End company was $40,000. The new company contemplates the installation of new equipment at this plant and will utilize its own switch to the plant. George W. Quillan, H. H. Davis and E. M. Marquand are at the head of the reorganized Chillicothe company.

Universal Gypsum Acquires Higginson Properties

THE Universal Gypsum and Lime Co., Chicago, announces the acquisition of the properties of the Higginson Manufacturing Co., consisting of the gypsum plant at Newburgh, N. Y., 270 acres of land at Windsor, Nova Scotia, containing large amounts of gypsum rock and an interest in the lime plant at Ossining, N. Y.

The mill at Newburgh, N. Y., is located on the Hudson river, where its 1000 ft. of water front offers excellent facilities for water delivery to the metropolitan district of New York and to steamship piers for export shipments. The property is situated directly between the river and the West Shore railroad.

In 1877 Col. Henry Higginson acquired the business of the Newburgh Cement Plaster Co., and under his guidance the Higginson company has manufactured high grades of gaging, molding and dental plasters. Colonel Higginson is said to have been the pioneer in importing Nova Scotia gypsum rock for the purpose of manufacturing plasters in the United States.

In securing the Higginson properties, the Universal company has rounded out a complete line of gypsum products. It now manufactures every gypsum product used in the building industry, including gypsum wallboard, gypsum block, "Insulex," a lightweight gypsum product, finishing, molding and cement plaster.

The company has sales offices located in the larger cities east of the Rocky Mountains, and manufacturing plants in New York state, Iowa, Texas, Pennsylvania and Virginia.

Convert Another Steamship for Use as Great Lakes Sand Boat

THE Great Lakes Steamship Co. recently sold the steamer *Charles M. Warner* to the Great Lakes Dredge and Dock Co. of Chicago, to be converted into a sand boat. The ship is of steel with a 370-ft. keel, 48-ft. beam and a depth of 28 ft. It was built in 1902 and has a carrying capacity of 6000 tons. This will be the fourth ship that has been converted within the past year for work as a sand boat, and the tenth within the past two years, according to the records of the Lake Carriers Association.

According to men in the ship business, the growth of water traffic in the sand and gravel industry has been steadily increasing. They point out that thousands of dollars have been spent in converting boats, and even building new boats, for this trade exclusively. In his annual report for 1926, Brig. Gen. Edgar Jadwin, chief of engineers for the War Department, said that commercial statistics for inland water transportation disclosed that there were 50 million tons of sand and gravel carried, which thus placed these products high on the list of inland water commerce. While there is some gravel and sand taken from the rivers and other lakes of the country, probably the bulk is handled on the Great Lakes. During the last year stone took a great leap forward, and it is predicted that sand and gravel are due to climb higher on the bulk transportation schedule.—*Duluth* (Minn.) *Herald.*

E. R. Ackerman to Retire from Lawrence Portland

AFTER many years' association with the Lawrence Portland Cement Co. of Siegfried, Penn., Ernest R. Ackerman, formerly vice-president of the company, has resigned all connection with the concern. His interests have been acquired by his brother, Marion S. Ackerman, vice-president, and Frank H. Smith.

Mr. Ackerman is a member of the House of Repreesntatives and owing to his many duties in Washington, has not been able to devote much time to the business of the company, and for that reason he decided to retire. For some time Mr. Smith has been connected with the cement company. He is also a director of several banking institutions, including the Plainfield Trust Co. and the Plainfield National Bank.—*Newark* (N. J.) *News.*

Ironton Gravel Co. Formed for Ohio River Dredging

ANOTHER sand and gravel company for the Ohio river was recently announced when it became known that the Ironton Gravel Co. of Ironton, Ohio, had been incorporated. The incorporators are G. C. Ross of East Liverpool, Ohio; Harry Nicely of Parkersburg, W. Va., and M. M. McKain of Ironton. All three men have had experience in the Ohio river sand business.

The new company has purchased the gravel plant operated by Gentil Bros. on the river front at Ironton, as well as all other equipment owned by that company. This equipment consists of a dredge, a towboat and a number of barges. To this the Ironton company has added two towboats, more barges, a fleet of motor trucks and other equipment. —*Ironton* (Ohio) *Tribune.*

Atkinson Co. to Build Two California Sand Plants

THE Atkinson Construction Co., a California contracting firm which recently built a large plant for sand and rock near its work on the Pardee dam in California, is now planning the establishment of two yards, at Stockton and Lodi, Calif., for the distribution of surplus rock from the plant. The main plant is at Lancha Plana, on the Mokelumne river, and is located on the site of old gold dredger workings, providing quartz rock and sand from the old tailings of the gold dredges.

The proposed plant at Stockton will cover about two acres and will represent an investment of approximately $40,000, according to Lynn Atkinson of the construction company. This will include a machine for ready-mixed concrete, which will also be distributed by the company. Fifteen men will be required to operate the plant. The Lodi plant will be similar but will not be as large. Options on sites for the two plants have already been secured, according to the reports.

The Atkinson company has spent close to $400,000 in equipping the Lancha Plana plant. Two 25-ton locomotives, 30 one-yard dump cars, railroad tracks, a large dragline and a complete sorting and grading plant have been erected there. From the plant to the railroad at the dam site a four-mile tramway with a capacity of 220 tons an hour has been erected. The bunkers at the dam site are so constructed that cars on the Southern Pacific R. R. can be loaded directly with either sand or gravel.

Mr. Atkinson pointed out that with the hundreds of acres of gold dredger dumpings near Lancha Plana the company has a practically inexhaustible supply for years to come, and it was with this idea in mind that such an expensive plant was built for the two-year construction work on the Pardee dam.—*Stockton* (Calif.) *Record.*

Current Abstracts and Patent Review

Method of Manufacturing a Hardening Agent for Cement or Lime. Tatsujiro Eukaya. Japan 8,022, March 10, 1926. Fluorides of hydrogen and silicon produced by pouring sulphuric acid on a mixture of fluorspar and a white crystalline substance which is collected in flues of phosphate-manure works where phosphate ores containing fluorine compounds are used, are passed through a solution of the white substance and chloride or carbonate of metal. After filtration, silicofluoride of metal is obtained by evaporating the filtrate under reduced press. The silicofluoride is used as the hardening agent. *Ceramic Abstracts* (1927), 502.

Anti-Freezing Agent for Concrete. Tatsujiro Fukaya. Japan 8,065, March 12, 1926. The agent is prepared by dissolving bichromate or chromate of potassium in filtrate from a heated solution of calcium chloride, quick lime, or slaked lime and ammonium chloride. *Ceramic Abstracts* (1927), 502.

Waterproof Plaster of Paris. Tatsujiro fukaya. Japan 8,096, March 17, 1926. In the manufacture of plaster of paris, a fusible substance such as resin or sulphur is mixed with raw gypsum. *Ceramic Abstracts* (1927), 502.

Process of Acid-Proofing Concrete Surface. Ichiro Kotani. Japan 9,567, July 23 1926. A mixture of asbestos and talc or amalgatolite is kneaded with a solution of sodium silicate. Surface of concrete or mortar is coated with it and after hardening, it is treated with dilute inorganic acid. *Ceramic Abstracts* (1927), 503.

Process of Manufacturing Magnesia Cement. Fumio Maeda. Japan 9,585, July 23, 1926. In the known method of manufacturing magnesia cement from magnesia and sulphate or chloride of magnesium, suitable amounts of gypsum and retarder such as glue, casein containing borax, dextrin, or gum arabic are added to them in order to prevent the cement from cracking. *Ceramic Abstracts* (1927), 503.

Method of Manufacturing White Cement. Tatsujiro Fuyaka. Japan 8,988, June 9, 1926. White-firing clay and limestone or quick lime are mixed in definite proportions and are ground with addition of alkali fluoride, cryolite, or fluoride of alkaline earth together with a substance producing an alkali fluoride such as alkali carbonate. The composition is fired with gas, liquid fuel, or indirect heat of solid fuel. *Ceramic Abstracts* (1927), 503.

Fired Cement Ware Resembling Pottery. Seikyu Ota. Japan 67,562, February 23, 1926. Ware is formed by means of a press with a plastic compound, composed of 1 part cement, about 0.5 part clay, and a suitable proportion of water. It is then coated with a soft glaze, dried, and fired for 10-15 minutes at 800 deg. C. *Ceramic Abstracts* (1927), 503.

The Rotary Kiln in the Lime Industry. The author, Theodor Klehe, made reference to rotary kilns adapted to lime burning as early as 1905, when he described in his book on rotary kilns the kiln built by Henry S. Spackmann for the New York Lime Co. at Natural Bridge. Producer gas was used as fuel, 7.5 tons of coal being consumed in burning 100 tons of limestone, the limestone being crushed to 50 mm. (almost 2-in.). The daily output amounted to 45 tons lime. The heat of the waste gases was sufficient to furnish steam for a 125-hp. steam engine, which supplied the power for the plant. These data seem unreasonable, when one remembers that only in recent years has waste heat utilization become a success. Dr. Ludwig Kiepenheuer reported in *Baumaterialienmarkt,* (1911) 3, that he made a study of this kiln and found that steam was added to the generator gases to keep the temperature down, as it was too high for lime burning. The low data of fuel consumption become even more doubtful for it seems unreasonable to produce gases of high temperatures, which have to be cooled before use and by a means necessitating further heat expenditure, such as generation of the steam. Tests at the California Portland Cement Co. showed the necessity of further crushing of the limestone to 10 to 35 mm.

Fellner & Ziegler A.-G., Frankfurt a.M. are making a rotary kiln for lime burning with a rated daily capacity of 90 to 100 tons. The kiln consists of the burning tube 200 ft. long and 7½ ft. in dia. and a cooler underneath 66 ft. in length.

The limestone is broken to ¾-in. to 1⅝-in. in size and fed to the kiln so that it descends towards the burning zone at the lower end. The fuel consumption is claimed to be 10 to 12 tons of coal per ton of lime produced. For dead burning dolomite, the fuel consumed is said to be about 36% of the final product.

The Polysius Co. in Dessau has designed a kiln which is said to be simple and economical. It consists of single tube, the calcining zone being joined directly to a cooler of 16 to 20 ft. length. This does away with special foundations and separate drive for the cooler.

Burning of lime in rotary kilns differs from the calcination of cement in that in the latter case the limestone is first decomposed to form calcium oxide and then is made to react with the argillaceous constituents of the mix. The latter reaction liberates heat, but can take place only at very high temperatures. In burning lime decarbonation completes the process and a reaction of the calcium oxide with other constituents would produce impurities in the product. In adapting a rotary kiln to lime burning, care should, therefore, be taken to provide means of cooling the gases immediately upon decarbonation. For economy, no foreign material such as steam can be used to cool the hot gases. This problem was solved and patented by Ferd. Meyer, Malstatt (German Patent No. 207, 881), as a process wherein the burned lime is made to cool the gases. Meyer resorted to the original form of the rotary kiln using three separate inclined tubes each above the other. In the first, or upper tube, the raw material is preheated and dried by the escaping gases. Decarbonation takes places in the second and cooling in the third or lowest kiln. Cooling is accomplished by an air current passing over the hot lime, becoming preheated and then being led to the combustion chamber for mixture with the hot gases. The combustion of the fuel, whether pulverized coal or producer gas, takes place in a separate combustion chamber, instead of in the kiln as in the cement industry. The gases traverse the kiln in the same direction as the charge. The temperature of the kiln can be regulated by admitting larger charges, which immediately reduce the temperature of the gases.

The Meyer rotary kiln was built by the Alpine Machine Co. in Augsburg. The company furnishes the following data of fuel consumption: A burning section 34 ft. long and 5 ft. in dia. reuires 17 tons of coal per 100 tons of lime and has a daily capacity (per 24 hours) of 50 tons lime. The material used was an impure limestone.

At present the Alpine Machine Co. has discontinued building rotary kilns for lime burning. There is reason to believe that poor fuel had much to do with the failure of an experiment to burn lime in an ordinary cement kiln, recently tried near Munich.

The cost of installation of a rotary kiln in Germany is much too high and is economical only for large scale production. Besides the added cost of crushing the stone, there must be considered cost of pulverizing the coal and the extra fuel required to dry the coal, all of which increases the operating expense. *Tonindustrie-Zeitung* (1927) 88, 1602-1604.

Artificial Stone from Blast-furnace Slag. Pig iron slag or basic slag from steel furnaces is ground to a fine powder in edge-runner mills with just sufficient water to

produce a plastic mass. During grinding, ammonia and hydrogen sulphite are evolved and hydrolysis of some of the constituents of the slag takes place, so that the resulting mass is endowed with setting and hardening properties like cement. The mass is mixed with a proportion of sandy slag and with 2.5% of cement, and the mixture is pressed into blocks, which are set aside to harden for 8 to 10 weeks. Very basic slags are preferably mixed with a certain quantity of acid slag to reduce the basicity during the grinding operation. *Stahl und Eisen* (1927), **47**, 1909-1910.

Organic Aggregates for Use with Cement—Organic material, such as wood shavings or sawdust, is expanded to above its maximum expansion by impregnation with a hot solution of a salt (lead chloride) which deposits insoluble crystals in the pores on cooling, or which, by further treatment with an appropriate reagent, combines with the reagent to form a solid filler or support to stabilize the material in its expanded condition. Mercuric chloride, calcium chloride, etc., may be used to act in addition as a preservative. *British Patent No.* 278,788.

Magnesium From Dolomite. Dolomite is treated with sodium bisulphate to obtain magnesium sulphate which is converted to the oxide by treatment with sodium carbonate and by subsequent calcination of the magnesium carbonate so formed, magnesium oxide results. *French Patent No.* 616,644.

Calcining Portland Cement in Rotary Kilns. The calcining zone is provided with an attachment containing channels for conveying the material under treatment, and with axial or approximately axial conduits through which a portion of the air for combustion is drawn into the flame. *German Patent No.* 440,747.

Production of Unsintered Hydraulic Cement. An intimate mixture of clay with quick, dry or slaked lime is calcined, using oil shale as fuel, and the product is ground to cement. Burnt shale may be added to the original mixture, and limestone or lime marl at any stage of the process.—*German Patent No.* 440,795.

Effect of Different Procedures on the Results of Analyses of Portland Cement. The importance of working out uniform methods was recognized early by the American Chemical Society and by scientists in France, Germany and Austria. The present tests were made to compare the results of four operators and the numerical values of determinations of silica and sesquioxides by two different procedures.

Portland cement from a shaft kiln and pure chemicals were used in the tests.

Procedure I. A 1 gm. sample of cement was mixed with 10 cc. water with an addition of 2.5 cc. hydrochloric avid (1:1) and the mixture evaporated to dryness over a steam bath, allowed to remain over the steam bath for one hour, left to stand for 5 minutes, given an admixture of 5 cc. concentrated hydrochloric acid, allowed to stand 5 minutes and mixed with 50 cc. water. The liquid was heated over a steam bath for 5 minutes, filtered through a S. & S. filter in such a way that the supernatent solution was first poured off and the precipitate decanted three times with 30 cc. boiling water each time and placed on the filter, then washed five times with boiling water. The solid residue retained on the filter was burned with the filter in a platinum crucible and ignited over a Meker burner for one hour.

The gain in weight of the platinum crucible gave the quantity of SiO_2 plus the acid insoluble. The filtrate was reduced to a volume of about 100 cc., mixed with 10 drops bromine water, 10 cc. *N/2* ammonium chloride, heated on a wire cloth and ammonia added with constant stirring until a distinctly alkaline reaction set in and the ammonia odor became pronounced. The beaker was then placed over a steam bath for 5 minutes and the solution of the hydrates was filtered through a S. & S. filter, decanted twice with 30 cc. water, to which were added a few drops of ammonia, and washed with ammonia water five times. The filter with the hydrates was then placed in a porcelain crucible, burned and ignited over a Bunsen burner. The gain in weight of the porcelain crucible gave the quantity of sesquioxides ($Al_2O_3 \cdot F_2O_3$). The filtrate from the hydrate determination was reduced to 200 cc. by evaporation over a free flame and 2 gm. solid powdered ammonium oxalate was then added while stirring constantly. The precipitated calcium oxalate was filtered after four hours on a S. & S. filter and washed free from chlorides with a 2% solution of ammonium oxalate. The filter together with the precipitate was placed in a platinum crucible, dried, burned and the calcium oxide ignited to constant weight. The gain in weight yielded the quantity of CaO. The filtrate from the calcium oxalate determination was reduced to 100 cc. and mixed with 10 cc. of 10% $Na_2HPO_4 \cdot 12H_2O$ and one-third volume of ammonia. The resulting precipitate of magnesium-ammonium phosphate was filtered on a S. & S. filter after 24 hours and washed with 3% ammonia solution until free from chlorides. The filter was placed in a platinum crucible and burned, the residue being ignited over a Meker burner for one hour. The weight of magnesium pyrophosphate was determined and reduced to magnesium oxide.

Procedure II. Silica and insoluble residue determined as in I. The remaining quantities of silica were obtained by repeated evaporation, as in I, filtered as above, but decanted after 10 minutes. A quantity of 50 cc. boiling water was used in each of the two decantations and the hydrates were dissolved in 10 cc. warm hydrochloric acid (1:4). The solution was introduced into a beaker, passing through the filter used in decanting. After washing the beaker and filter with distilled water the solution was brought to the boiling point and washed with ammonia until a slightly alkaline reaction set in. The freshly precipitated hydrates were separated by filtering and ignited to oxides as in I.

Conclusions. In using procedure I, considerable discrepancies are noted not only with different operators, but also between the results of the same operator. These occur mainly in the silica and sesquioxide determinations. The maximum discrepancies were 0.37% for silica and 0.67% for sesquioxides.

In using procedure II all determinations yield closely agreeing results. The maximum discrepancies were 0.15% for silica, 0.18% for sesquioxides, 0.10% for lime, 0.08% for magnesia.

Another series was devoted to the study of the following procedures: (a) Hillebrand, (b) Lehigh Valley section of the American Chemical Society, (c) laboratory of the Association of German Portland Cement Manufacturers, (d) Dr. Jaroslav Matejka. The first, third and fourth procedures yielded a very satisfactory agreement. *Zement* (1927), 974-77.

Effects of Cold Water on Alumina Cements. Tests were made by H. Vierheller of standard specimens of alumina cement exposed to very low temperatures immediately upon filling the molds. It was found that all of the mixing water froze before initial set took place, the cubes gaining their usual strength only upon thawing of the ice crystals. However, when large specimens are used, the effect of low temperature is reduced, as large masses of concrete develop considerable heat during hardening which counteracts to a certain extent the effect of freezing.

A 30 cm. cube of 1 part alumina cement and 3 parts standard sand mixed with 8.75% water and tamped into an ordinary wooden form 2½ cm. thick was exposed immediately upon tamping to temperatures of —6 deg. to —8 deg. C. The surface of the cube was covered with paper and a layer of sand 2 cm. thick.

After 2½ hr. the lowest point to which the temperature of the cube descended was reached at + 6.7 deg. C. Start of setting raised the temperature to + 27 deg. C. After 14 hr. the temperature at a point 5 cm. from the surface of the cube was + 9 deg. C., the surrounding temperature being —8.5 deg. C. Only at the end of about 17½ hr. did the temperature drop to zero. At that time hardening of alumina cement had already progressed for some time, the temperature of the setting concrete ranging from + 70 deg. C. to + 27 deg. C., these temperatures satisfying the strictest requirements. After 24 hr. exposure to freezing the specimen showed perfect hardening when the form was removed. In spite of imperfect surface of the form, the cube, when tested, yielded a compressive strength of 4950 lb./in.^{2} after 10-day exposure to freezing.

The author's conclusions are that alumina cement differs from high strength portland cement in that its set is less influenced by low temperatures. *Zement* (1927) 998-99.

Traffic and Transportation

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Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts), as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL STONE AND LIMESTONE FLUX

	Limestone Flux Week ended		Sand, Stone and Gravel Week ended	
District	Dec. 31	Jan. 7	Dec. 31	Jan. 7
Eastern	1,403	1,481	1,533	1,103
Allegheny	1,996	2,282	1,952	1,413
Pocahontas	134	201	280	267
Southern	398	342	5.601	5,557
Northwestern	446	380	1,009	477
Central western	301	309	3,125	3.562
Southwestern	433	414	2,489	2,371
Total	5,111	5,409	15,989	14,750

COMPARATIVE TOTAL LOADINGS FOR THE FULL YEAR, BY DISTRICTS, 1926 AND 1927

	Limestone Flux		Sand, Gravel and Stone	
District	1926	1927	1926	1927
Eastern	170,855	165,300	515,260	540,377
Allegheny	200,303	181,406	390,951	418,672
Pocahontas	25,555	25,040	45,639	48,041
Southern	32,906	30,103	637,491	620,715
Northwestern	73,100	65,006	320,732	347,780
Central western	26,131	25,219	460,691	482,631
Southwestern	15,437	19,694	267,197	301,198
Total	544,287	511,768	2,637,961	2,759,414

COMPARATIVE TOTAL LOADINGS FOR THE FULL YEAR, 1926 AND 1927

	1926	1927
Limestone flux	*544,287*	*511,768*
Sand, stone, gravel	*2,637,961*	*2,759,414*

COMPARATIVE TOTAL LOADINGS 1927 AND 1928

	1927	1928
Limestone flux	*7,587*	*5,409*
Sand, stone, gravel	*25,728*	*14,750*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning January 28:

SOUTHERN FREIGHT ASSOCIATION DOCKET

38005. **Gravel**, from Camden, Tenn., to I. C. R. R. stations, Medina to Bradford, Tenn., inclusive. **It is proposed to establish reduced rates on gravel**, carloads (See Note 3), from Camden, Tenn., as follows: To Medina, West, Sitka, Milan, Cades and Idlewild, Tenn., 95c; to Bradford, Tenn., 105c per net ton. Proposed rates are based on I. C. C. Docket 17517 joint line scale for shortest available distance.

38047. **Marble, broken or crushed**, from Gantt's Quarry, Ala., to Milton, Fla. Class "A" rate now applies. Proposed rate on **marble, broken or crushed**, carloads (See Note 3), from Gantt's Quarry, Ala., to Milton, Fla., 190c per net ton, made on the same basis as employed in determining present rates on crushed stone to De Funiak Springs and Marianna, Fla.

37810. (Originally docketed for January 16, 1928, hearing—Docket No. 400.) **Sand**, from Leedy, Miss., to southeastern destinations. It is proposed to establish the following rates on **sand**, carloads (See Note 3), from Leedy, Miss., in cents per net ton:

To	Rate	To	Rate
Anniston, Ala.	150	Chattanooga, Tenn.	160
Gadsden, Ala.	248	Cleveland, Tenn.	170
Talladega, Ala.	160	Knoxville, Tenn.	180
Sheffield, Ala.	105	Lenoir City, Tenn.	180
Atlanta, Ga.	175	Nashville, Tenn.	150
Columbus, Ga.	225		

The suggested rates are made in line with present rates from Evansville, Ind., for equi-distances, observing the I. C. C. Docket 17517 scale rates as minima.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

38099. **Agricultural stone** from Hopkinsville, Ky., to Indiana destinations on the L. & N. R. R. In lieu of class "A" rates it is proposed to establish the following commodity rates on **stone, agricultural (ground limestone)**, carloads, minimum weight 60,000 lb.

Note—When loaded in box cars, same to be lined with strong paper to prevent loss, from Hopkinsville, Ky. In cents per net ton:

To	Rate	To	Rate
Rahm, Ind.	108	Caborn, Ind.	117
Vaughan, Ind.	108	Mt. Vernon, Ind.	117
Evansville, Ind.	117	Upton, Ind.	126
St. Phillip, Ind.	117	Welborn, Ind.	126
Lippe, Ind.	117		

The suggested rates are made on basis of scale used extensively in establishing rates on this commodity between points in southern territory.

38132. **Marble, ground or pulverized**, from Tate, Ga., to Houston-Galveston group. Present rate, 1230c per net ton. Proposed rate on **marble, ground or pulverized**, carloads, minimum weight 50,000 lb., from Tate, Ga., to Houston-Galveston, Tex., group, as per Agent Johanson's I. C. C. 1096, 852c per net ton, same as the present rate on whitestone, carloads, from Whitestone, Ga., to the same destinations.

ILLINOIS FREIGHT ASSOCIATION DOCKET

1743-I. To establish from Muscatine, Iowa., to Ohio River and Mississippi River crossings, Thebes, Ill., to Cincinnati, Ohio, inclusive (applicable on traffic destined to points in Kentucky and Tennessee), a proportional rate on **sand**, all kinds, carloads (See Note 3), made with relation to the present rate of $2.75 per net ton from Ottawa, Ill., to Ohio River and Mississippi River crossings.

4329. To establish commodity rate of 88c per ton of 2000 lb. on **sand, gravel and crushed stone**, as described in tariffs of individual carriers, from sand, gravel and stone producing points, viz.: Pekin, Lincoln, Quincy, etc., Ill., Hannibal and Louisiana, Mo., to Jacksonville, Ill.

CENTRAL FREIGHT ASSOCIATION DOCKET

17425. To establish on **agricultural lime**, carloads, Gibsonburg and Woodville, Ohio, to Coshocton, Ohio, via Penn. R. R., rate of 10c. Present rate, 8c.

17426. To establish on **crushed stone**, in open top cars, carloads, Bay Port and Quarry, Mich., to Youngstown, Ohio, rate of $2 per net ton. Present rate, 25½c.

17430. To establish on **sand, viz., blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica**, carloads, Moons and Gerry, N. Y., to New York, Pennsylvania and Ohio, following rates (in cents per net ton):

To	Pres.	Prop.
Cleveland	*214	151
Corry, Penn.	†260	100
Dunkirk, N. Y.	*100	83
Erie, Penn.	*139	113
Jamestown, N. Y.	†230	83
Meadville, Penn.	†300	139
Oil City, Penn.	†300	151
Titusville, Penn.	†280	113
Warren, Penn.	†230	100

*Intermediate commodity rate.
†Classification basis.

17431. To establish on **crushed stone**, carloads, White Bear, Mo., to points in C. F. A. territory, same commodity rates as in effect from Hannibal, Mo. Illustrations of present and proposed rates (in cents per net ton):

To	Pres.	Prop.
St. Clair, Mich.	530	480
Detroit, Mich.	500	450
Toledo, Ohio	470	420
Cleveland, Ohio	510	460
Cincinnati, Ohio	460	410
Indianapolis, Ind.	430	380

Present rate—Combination.

17432. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads, from Chicago district points to points in Indiana, following rates (in cents per net ton):

To	Pres.	Prop.
N. J. I. & I. R. R.:		
South Bend	101	90
Sweeney's	101	90
Pine	101	90
Wabash Ry.:		
Pine	101	90
North Liberty	100	90
Dillon	100	90
Kingsbury	100	90
Magee	95	90
Westville	95	90
Crocker	92	90
Willow Creek	92	90

Route—Wabash Ry. and N. J. I. & I. R. R.

17189. To establish on **crushed stone**, in bulk in open top cars, carloads, from Centerville, Ohio, to Hughes and Sharonville, Ohio, rate of 85c and 90c per net ton, respectively. Present rate, 90c and $1 per ton, respectively.

17467. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Attica, Ind., to Meredosia, Perry Springs, Versailles, Gilbirds, Hersman, Mt. Sterling, Timewell, Clayton, Camp Point, Blacks, Golden, Bowen, Denver, Bentley, Carthage, Elvaston, Hamilton, Naples, Valley City, Griggsville, Maysville, Pittsfield, New Salem, Baylis, Arden, Hadley, Barry and Kinderhook, Ill., rate of 122c per net ton. Present rates—Rate of 139c per 2000 lb. to Meredosia, Perry Springs, Versailles, Gilbirds, Hersman, Mt. Sterling, Timewell, Clayton, Camp Point, Blacks, Golden, Bowen, Denver, Bentley, Carthage, Elvaston and Hamilton, Ill., and 113c per 2000 lb. to Naples, Valley City, Griggsville. Maysville, Pittsfield, New Salem, Baylis, Arden, Hadley, Barry and Kinderhook, Ill. Route—Via Wabash Ry. direct.

17489. To establish on **sand and gravel**, carloads, Connersville, Ind., to Cedar Grove, Ashby, New Trenton and Longnecker, Ind., rate of 70c per net ton, and to Harrison, Ind., rate of 75c per net ton. Present rate, sixth class.

17491. To establish on **crushed stone**, carloads, Spore, Ohio, to Ashland, Ohio, rate of 85c per net ton. Route—Via N. Y. C. R. R., Martel, Ohio, and Erie R. R. Present rate, 90c per net ton.

17496. To establish on **gravel and sand**, except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and

silica, carloads, Kenneth and Lake Ciecott, Ind., to Benton Harbor, Mich., rate of $1.17 per net ton. Present rate, $3.40 per net ton.

17497. To establish on **sand and gravel**, carloads, Lafayette, Ind., to Tucker, Ill. (Illinois Central Ry.), rate of 88c per net ton. Present rate, $1 per net ton.

17504. To establish on **gravel and sand**, except blast, core, engine, filter, fire or furnace, glass, grinding or polishing, loam, molding or silica, in open top cars, carloads, Anderson, Ind., to stations in Indiana on C. C. C. & St. L. Ry., Whitewater Division of the C. C. C. & St. R. Ry., rates as shown below (present and proposed rates, per net ton):

To	Pres.	Prop.*	To	Pres.	Prop.*
Milton	$.90	$2.60	Yellow Bank	1.00	3.00
Beesons	.90	2.60	Brookville	1.00	3.00
Connersville	.90	2.60	Cedar Grove	1.10	3.00
Milltown	.90	2.70	Ashby	1.10	3.00
Alpine	.90	2.70	New Trenton	1.10	3.00
Laurel	1.00	2.70	Longnecker	1.10	3.20
Metamora	1.00	2.70	Harrison	1.10	3.20

*Sixth class.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

13762. **Sand, building, common or run of bank**, carloads (See Note 2), from Northford, Conn., to Stamford, Conn., 85c per net ton. Reason—To provide Northford, Conn., with the rate it is entitled to by its geographical location.

13765. **Stone, broken or crushed**, in bulk, open cars, carloads (See Note 2), to Providence, R. I., from Branford (Pine Orchard Quarry), East Berline (Beckley's Quarry), R. I., from Branford (Pine Orchard Quarry), East Haven, East Wallingford (Reeds Gap Quarry), Meriden, Meriden (York Hill Quarry), Rocky Hill., Conn., $1 net ton; Westfield, Mass., $1.10 net ton. It is proposed further to add to these rates an expiration clause reading, "Rates will expire with December 31, 1928, unless sooner canceled, changed or extended." Reason—To provide an equitable basis for the movement of this stone from Westfield, Mass., and to further provide an expiration date on all of these stone rates.

13761. **Dust, stone**, between stations on the N. Y., N. H. & H. R. R. Co.—Clarification of tariff so that crushed stone commodity rates will not apply on stone dust, and that same will be subject to Official Classification rating of sixth class.

13769. **Stone, broken or crushed**, carloads, in bulk, in gondola or other open top cars (see Note 3), from Westfield, Mass.. to Litchfield, $1.25; to Bantam, $1.20. and to Willimantic, Conn., $1.05 per net ton. Reason—Necessary to move traffic via rail.

13771. **Stone, crushed**, in bulk in open cars, carloads (See Note 2), from East Wallingford, Conn. (Reeds Gap Quarry), to Montowese, Conn., 50c per net ton, and **sand, building, common or run** of bank, carloads (See Note 2), from New Haven, Conn., to Montowese, Conn., 50c per net ton. (These rates to expire with December 31, 1928, unless sooner canceled, changed or extended.) Reason—To meet competitive conditions.

13773. **Stone, broken or crushed**, in bulk in gondola or other open top cars, carloads (See Note 3), from East Wallingford (Reeds Gap Quarry) and New Britain (Cooks Quarry), Conn., to Branchville, Conn., 95c per net ton. (Rate will expire October 15, 1928, unless sooner canceled, changed or extended). Reason—To meet competitive conditions and to allow rate to remain in effect until job is completed.

13777. **Stone, broken or crushed**, in bulk, in gondola or other open top cars, carloads (See Note 3), from Westfield, Mass., to Charlemont, Mass., $1.30 per net ton via Northampton, Mass., and B. & M. R. R. Reason—To provide a rate that will permit movement.

13750. **Rubble or grout, granite or stone**, in bulk, in open cars, carloads (See Note 2), from Stony Creek, Conn., to New Haven, Conn., 50c per net ton. Reason—To meet competition of barge and motor trucks.

13785. **Agricultural lime and limestone**, carloads, minimum weight 40,000 lb., from Fonda Jct., Highgate Springs, Winooski and Swanton, Vt., to B. & M. R. R. stations, typical proposed rates and destinations being: To Keene, N. H., to South Ashburnham, Mass., 13½c and 14½c; to Woodsville, N. H., to Graveton, Berlin and Fabyan, N. H., 14c and 14½c; to Deerfield, Mass., to Springfield, Mass., including Hampton Mills, Easthampton and Chicopee Falls, Mass., 14c and 15c per 100 lb. on agricultural limestone and agricultural lime, respectively. Reason—Comparable with rates now in effect from producing points on the Maine Central R. R. to same points of destination on the B. & M. R. R. per Me. C. R. R. I. C. C. No. C4167.

13790. **Sand, common, run-of-bank**, carloads, (See Note 2), from Beacon, N. Y. (ex barge), to Verbank, N. Y., 3½c. Reason—To provide a rate for new movement of traffic.

WESTERN TRUNK LINE DOCKET

3089G, redocketed—Rate: **Limestone, ground**, carloads, minimum weight 40,000 lb., from Quincy, Ill., to Ft. Dodge, Iowa. Present—Class E, 20½c per 100 lb. Proposed—14c per 100 lb.

2556I—Rate: **Stone, broken**, viz.: rip rap or rubble and strippings (See Note 3). In no case shall the minimum weight be less than 40,000 lb., from Winona, Minn., to Chicago, Ill. Present—14½c per 100 lb. Proposed—9½c per 100 lb.

TRUNK LINE ASSOCIATION DOCKET

17481. **Crushed stone, carloads** (See Note 2), from York, Penn., to District Line to Penna Jct., Md., incl., Mt. Calvert to Owings, Md., incl., $1.60, and Mt. Harmony to Chesapeake Beach, Md., incl., $1.75 per ton of 2000 lb. Reason—To establish rates that will be fairly comparable with rates now in force from Frederick, Md., as per B. & O. R. R. I. C. C. No. 20810.

17482. **Sand**, N. O. I. B. N. in O. C., other than blast, engine, foundry, glass, molding, quartz, silica or silex, carloads (See Note 2), from Cadosia, N. Y., to Mayfield, Penn., $1.05 per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force to Green Ridge and Scranton, Penn., as per N. Y. O. & W. Ry. I. C. C. 9802.

17483. To cancel rate of 17c per 100 lb. on **limestone, agricultural, ground, precipitated, pulverized and limestone dust**, carloads, from Buffalo, N. Y., stations to Delaware and Northern R. R. stations, Arkville, N. Y., to Harvard, N. Y., incl., combination rates to apply.

17496. **Gravel and sand** (other than blast, engine, glass, molding or foundry), carloads (See Note 2), from Bragers, Md., to Cumberland, Md., $2 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Port Covington, Md., to Cumberland and Luke, Md., and from Hancock, Md., to Durbin and Weaver, W. Va., as per W. Md. I. C. C. 7847.

17514. **Agricultural lime**, carloads, minimum weight as per O. C., from Avis, Penn.

To	Prop. Rate	To	Prop. Rate
Lewisburg	10	Arters	10
Winfield	10	Snydertown	10
Blue Hill	10	Reed	10
Clement	10	Paxinos	10
Sanbury	10	Shamokin	14

Reason—Proposed rates are comparable with rates from Bellefonte, Penn., as per P. R. R. G. O. I. C. C. 14567.

17521. **Crushed stone**, carloads (See Note 2), from Water Street, Goodman, Blair Limestone Co., No. 4, Carlim, Canoe Creek Stone Co., Franks-town, Calcite, Wertz, Barree, Union Furnace, Tyrone Forge, Stover, Penn., to Safe Harbor, Penn., $1.75 per ton of 2000 lb. Reason—Proposed rates are comparable with rates from same points of origin to Harrisburg and DuBois, Penn., as per P. R. R. G. O. I. C. C. No. 14487.

17532. **Crushed stone**, carloads (See Note 2), from Philadelphia (Port Richmond), Penn., to Runnemede, N. J., 75c per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force to Eddystone, W. Conshohocken, Norristown, Penn., etc., as per Rdg. Co. I. C. C. No. 195.

17551. **Sand**, carloads (See Note 2), from South Vineland, Millville, Clayville, Menantico and Manumuskin, N. J., to Grenloch and Camden, N. J., $1.50 per ton of 2000 lb. Reason—Proposed rate is comparable with rates on like commodity from Cape May, N. J., to Grenloch, N. J., as per Reading Co. I. C. C. 309.

17558. (A) **Building lime**, carloads, minimum weight, 30,000 lb. (B) **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb.; also ground limestone, carloads, minimum weight 50,000 lb., from New York and Union Square Co., Penn., to Shenandoah, Penn., (A) 12½c and (B) 11½c per 100 lb. Reason—Proposed rates are comparable with rates now in force from Bainbridge, Penn., as per P. R. R. G. O. I. C. C. No. 14567.

17559. **Agricultural, land, chemical, gas or glass lime**, carloads, minimum weight 30,000 lb., also **ground limestone**, carloads, minimum weight 50,000 lb., from Bellefonte and Pleasant Gap, Penn., to Vineland and Millville, N. J., 15½c per 100 lb. Reason—Proposed rates are same as now at present in force to Bridgeton, N. J., as per P. R. R. G. O. I. C. C. No. 14567.

17564. **Sand**, other than blast, engine, foundry, glass, molding or silica, and **gravel**, carloads (See Note 2), from Canawaugus, N. Y., to Friendship, N. Y., $1.10 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Buffalo, N. Y., to Friendship, Bennetts, Birdsall and Grove, N. Y., as per P. R. R. G. O. I. C. C. No. 14198.

17568. **Sand**, other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, also **gravel** (See Note 2), carloads, from Bacon Hill, North East, Charlestown and Principio, Md., to Waynesboro, Penn., $1.85 per ton of 2000 lb. Reason—To establish rate which will be comparable with those in force from Baltimore, Philadelphia and Williamsport, Penn., as per P. R. R. G. O. I. C. C. 14738.

17576. **Crushed stone**, N. O. I. B. N. in O. C., carloads (See Note 2), from Mill Hall, Penn., to Renovo, Penn., $1.25 per ton of 2000 lb. Reason—Proposed rate compares favorably with rates from Mill Hall, Penn., to Williamsport, Newberry Jct., Muncy, Loyalsock, Penn., as per N. Y. C. R. R. I. C. C. N. Y. C. No. 14884.

17577. **Crushed stone**, carloads (See Note 2), from Auburn, N. Y., to Wysox, Penn., $1.25 per ton of 2000 lb. Reason—Proposed rate is comparable with rates now in force on like commodity for like distances, services and conditions.

17585. **Lime**, carloads, minimum weight 40,000 lb., and **ground limestone**, carloads, minimum weight 50,000 lb., from York, Penn., to Ancram, N. Y., lime 22½c and ground limestone 22c per 100 lb. Reason—Proposed rates are comparable with rates now in force from York, Penn., to Canaan, Conn., and Worcester, Mass., as per P. R. R. G. O. I. C. C. No. 13804.

17587. **Stone (fluxing)**, carloads (See Note 2), from Atlas, Hamburg and Lime Crest, N. J., to Gloucester, N. J., $1.89 per ton of 2240 lb. Reason—Proposed rate is comparable with rates now in force to Camden, N. J., as per L. & H. R. Ry. I. C. C. A-1779.

17588. **Sand** (other than blast, engine, foundry, glass, molding or silica) and **gravel** carloads (See Note 2), from La Grange, Penn., and Falls, Penn., to Elmhurst, Penn., $1.15; Moscow and Lehigh, Penn., $1.25, and Henryville, Penn., $1.60 per ton of 2000 lb. Reason—Proposed rates are comparable with rates on like commodities now in force for similar distances, conditions and services.

17600. **Crushed stone**, carloads (See Note 2), from White Haven, Penn., to Danielsville and Berlinsville, Penn., $1.50 per ton of 2000 lb. Reason—Proposed rate compares favorably with rate from Steuben, Penn., to White Haven to Union Jct., Penn., inclusive, as per L. & N. E. R. R. I. C. C. A5627.

17620. **Sand** (other than blast, engine, foundry, glass, molding and silica) **and gravel**, carloads (See Note 2), from Lake Aeriel, Penn., to Pocono Lake, Penn., $1.15 per ton of 2000 lb. Reason—Proposed rate is comparable with rates on like commodities from and to points in this same general territory as per Erie R. R. I. C. C. 17980 and C. N. J. I. C. C. G2909.

17621. **Sand** (other than blast, engine, foundry, glass, molding or silica) **and gravel**, carloads (See Note 2), from Georgetown, D. C., to Rockville, Md., 70c per ton of 2000 lb. Reason—Proposed rate is comparable with rates from Georgetown, D. C., and Contee, Md., to Shepherd, D. C., Bethesda and Linden, Md.

Recent I. C. C. Decisions

16356. Portland Cement. A finding of unreasonableness, a denial of reparation, and an order requiring new rates on cement, effective December 15, 1927, have been made. The Commission, by division 1, found that rates on portland cement, from Mason City, Ia., to northern Minnesota and North Dakota, in extended cement Scale III and IV territories, and to points on the Soo Line's branches in South Dakota unreasonable but not unduly prejudicial. It prescribed revised Scale III and IV rates as maximum reasonable bases. Reparation was denied on the principles governing in general revision cases.

This finding covers the territorial scope of the complaint. The Commission, however, thinks the revision of rates should be extended to the rates from Steelton and Duluth, so as to reflect the same scale basis, calculated on distances from Duluth, as prescribed from Mason City, and that the rates from other related producing points should be revised so as to reflect substantially the same differences over the corresponding rates from Mason City as are reflected in the present relationships of the key-point rates to St. Paul from Mason City, on the one hand, and from such related producing points, on the other hand.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chaumont, N. Y.	.50	1.75	1.75	1.50	1.50	1.50
Chazy, N. Y.	.75	.....	1.60	1.30	1.30	1.30
Dundas, Ont.	.30	1.05	1.05	.90	.90	.90
Frederick, Md.	.50@1.00	1.35@1.50	1.15@1.50	1.10@1.15	1.05@1.10	1.05@1.10
Ft. Spring, W. Va.	.50	1.45	1.35	1.25	1.20	.....
Munns, N. Y.	1.00	1.50	1.50	1.40	1.25	.....
Northern New Jersey	1.60	1.50@1.80	1.30@2.00	1.40@ .60	1.40@1.60	.....
Prospect, N. Y.	1.00	1.40	1.25	1.25	1.25	.....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
St. Vincent de Paul, Que.	.75	1.35	1.20	1.00	1.00	1.15
Walford, Penn.	.....	.....	1.35h	1.35h	1.35h	1.35h
Watertown, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Afton, Mich.	.....	.....	.50	.50	.50	1.50
Alton, Ill.	1.85	.....	1.85	.....	.....	.....
Columbia and Krause, Ill.	.90@1.20	.90@1.20	1.00@1.20	1.00@1.20	1.00@1.20	1.25
Cypress, Ill.	1.25	1.15	1.10	1.00	1.00	1.00
Dubuque, Iowa (e)	.75	1.20@1.30	.....	1.20@1.30	1.20@1.25	.....
Greencastle, Ind.	1.25	1.25	1.15	1.05	.95	.95
Lannon, Wis.	.80	1.00	1.00	.90	.90	.90
Linwood, Iowa (f)	1.10	1.55	1.55	1.55	.....	.....
McCook, Ill.	1.00	1.25	1.25	1.25	1.25	1.25
Marblehead, Ohio (l)	.55	.80	.80	.80	.80	.80
Milltown, Ind.	.....	.90@1.00	1.00@1.10	.90@1.00	.85@ .90	.85@ .90
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.20	1.05	1.00	.....
Toledo, Ohio	1.60	1.70	1.70	1.60	1.60	1.60
Toronto, Canada (m)	2.50	3.00	3.00	2.85	2.85	2.85
Valmeyer, Ill. (fluxing limestone)	.90@1.20	.....	.....	1.75	.....	1.75
Waukesha, Wis.	.90	.90	.90	.90	.90	.....
Wisconsin Points	.50	.....	1.00	.90	.90	.....
Youngstown, Ohio	.70j	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h	1.25l@1.35h
SOUTHERN:						
Atlas, Ky.	.50	1.00	1.00	1.00	1.00	1.00
Cartersville, Ga.	1.50	1.65	1.65	1.35	1.15	.....
Chico and Bridgeport, Tex.	1.00	1.30	1.25	1.20	1.05	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Graystone, Ala.	Crusher run, screened, $1 per ton					
Kendrick and Santos, Fla.	3½ in. and less, $1 per ton					
Rocky Point, Va.	.50@ .75	1.40@1.60	1.30@1.40	1.15@1.25	1.10@1.20	1.00@1.05
WESTERN:						
Atchison, Kan.	.25	1.90	1.90	1.90	1.90	1.80
Blue Springs & Wymore, Neb.	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.25	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30	1.00	1.00	1.00	1.00	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Duluth, Minn.	.90	2.00	1.75	1.55	1.25	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Tex.	2.50	2.25	1.65	1.35	1.25	.....
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.80	2.30	2.30	1.70	1.70	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
San Diego, Calif.	.50@ .75	1.25@1.50	1.25@1.50	1.10@1.25	1.10@1.25	.....
Springfield, N. J.	2.10	2.20	2.10	1.70	1.70	1.60
Toronto, Canad (m)	.....	5.80	4.05	4.05	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Berlin, Utley, Montello and Red Granite, Wis.—Granite	1.80	1.70	1.50	1.40	1.40	.....
Cayce, S. C.	.50	2.00	1.75@1.90	1.75@1.90	1.65@1.75	.....
Eastern Penn.—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Penn.—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.	Crushed flint rock, 2.50 per cu. yd.					
Lithonia, Ga.—Granite	.75a	2.00b	1.75	1.40	1.35	1.25
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	.....
Middlebrook, Mo.	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.25@3.00
Richmond, Calif.—Quartzite	.75	.....	1.00	1.00	1.00	.....
Somerset, Penn. (sand-rock)	.....	.....	1.50 to 1.85	.....	.....	.....
Toccoa, Ga.	.....	.....	1.40	1.25	1.25	1.25

(a) Sand. (b) to ⅛ in. (c) 1 in., 1.40. (d) 2 in., 1.30. (e) Price net after 10c cash discount deducted. (f) 1 in. to ¼ in., 1.45; 2 in. to ¼ in., 1.35. (h) Less 10c discount. (j) Less 10% net ton. (l) Less .05. (m) Plus .25 per ton for winter delivery.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.01% $MgCO_3$; 90% thru 100 mesh 4.50
Atlas, Ky.—90% thru 100 mesh 2.00
50% thru 100 mesh 1.00

Bettendorf and Moline, Ill.—Analysis, $CaCO_3$, 97%; 2% $MgCO_3$; 50% thru 100 mesh, 1.50; 50% thru 4 mesh 1.50

Blackwater, Mo.—100% thru 4 mesh 1.00

Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh 5.00

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 93½%; $MgCO_3$, 3½%; 50% thru 50 mesh 1.50

Cartersville, Ga.—90% thru 4 mesh 1.50

Charleston, W. Va.—Marl, per ton, bulk 3.00

Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk 2.50

Chico, Tex.—50% thru 50 mesh, 1.75; 50% thru 100 mesh 2.25

Cypress, Ill.—Analysis, 88% $CaCO_3$; 10% $MgCO_3$; all sizes 1.25

Ft. Spring, W. Va.—50% thru 50 mesh 1.00

Hartford, Conn.—Paper bags, 4.25; cloth bags, 4.75; bulk 3.25

Hillsville, Penn.—Analysis, 94% $CaCO_3$; 1.40% $MgCO_3$; 75% thru 100 mesh; sacked 5.00

Hot Springs and Greensboro, N. C.—Analysis, $CaCO_3$, 98-99%; $MgCO_3$, 42%; pulverized; 67% thru 200 mesh; bags 3.95
Bulk 2.70

Jamesville, N. Y.—Analysis 89% $CaCO_3$, 4% $MgCO_3$; pulverized; bags, 4.25; bulk 2.75

Joliet, Ill.—Analysis, 52% $CaCO_3$; 44% $MgCO_3$; 90% thru 100 mesh 3.50

Knoxville, Tenn.—80% thru 100 mesh; bags, 3.95; bulk 2.70

Ladds, Ga.—Analysis, $CaCO_3$, 64%; $MgCO_3$, 32%; pulverized; 50% thru 50 mesh 1.50@ 2.75

Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.00; bulk 3.50

Marlbrook, Va.—Analysis, 80% $CaCO_3$; 10% $MgCO_3$; bulk, 1.75; bags 3.75
Marl—Analysis, 90% $CaCO_3$; 10% $MgCO_3$; bulk, 2:25; bags 4.00

Marion, Va.—Analysis, 90% $CaCO_3$, pulverized, per ton 2.00

Middlebury, Vt.—Analysis, 90.05% $CaCO_3$; 90% thru 50 mesh 6.00

Milltown, Ind.—Analysis, 94.50% $CaCO_3$, 33% thru 50 mesh, 40% thru 50 mesh; bulk 1.35@ 1.60

Olive Hill, Ky.—90% thru 4 mesh 1.00

Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100 2.50@ 2.75
100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk 3.60
99% thru 100, 85% thru 200; bags, 7.00; bulk 5.50

Rocky Point, Va.—Analysis, $CaCO_3$, 97%; 50% thru 200 mesh, burlap bags, 3.50; paper, 3.25; bulk 2.00

Syracuse, N. Y.—Analysis 89% $CaCO_3$; $MgCO_3$, 4%; bags, 4.25; bulk 2.75

Toledo, Ohio—30% thru 50 mesh 2.25

Watertown, N. Y.—Analysis, 96-99% $CaCO_3$; 50% thru 100 mesh; bags, 4.00; bulk 2.50

Agricultural Limestone

(Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$, 0.3% $MgCO_3$; 50% thru 4 mesh 3.00
Atlas, Ky.—90% thru 4 mesh 1.00

Bedford, Ind.—Analysis, 98.5% $CaCO_3$, 0.5%; $MgCO_3$; 90% thru 10 mesh 1.50

Brandon, Vt.—Bulk 4.00

(Continued on next page)

Agricultural Limestone

Bridgeport and Chico, Texas—Analysis, 94% $CaCO_3$, 2% $MgCO_3$; 90% thru 100 mesh	3.50
Chicago, Ill. — 50% thru 100 mesh; 90% thru 4 mesh	.80
Columbia, Krause, Valmeyer, Ill. — Analysis, 90% $CaCO_3$; 100% thru 4 mesh	1.10@ 1.50
Cypress, Ill.—90% thru 50 mesh, 50% thru 100 mesh, 90% thru 50 mesh, 90% thru 4 mesh	1.35
Danbury, Conn.; Adams, Ashley Falls and West Stockbridge, Mass.—Analysis 90% $CaCO_3$, 5% $MaCO_3$; 50% thru 100 mesh, bulk	3.50
100-lb. paper bags	4.75
100-lb. cloth bags	5.25
(All prices less 2%, 15 days.)	
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$; 90% thru 50 mesh	1.50
Kansas City, Mo. — 50% thru 100 mesh	1.00
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92¼ $MgCO_3$, 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk	1.60
Mayville, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 50% thru 50 mesh	1.85@ 2.35
McCook, Ill.—90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Logansport, Ind.—85% thru 10 mesh, 20% thru 100 mesh	1.50
Moline, Ill., and Bettendorf, Iowa—Analysis, 97% $CaCO_3$, 2% $MgCO_3$; 50% thru 100 mesh; 50% thru 4 mesh	1.50
Mountville, Va. — Analysis, 62.54% $CaCO_3$; $MgCO_3$, 35.94%, 100% thru 20 mesh; 50% thru 100 mesh, bags	5.00
Pixley, Mo. — Analysis, 96% $CaCO_3$; 50% thru 50 mesh	1.25
50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh	1.65
River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk	.80@ 1.40
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Tulsa, Okla.—Analysis $CaCO_3$, 86.15%, 1.25% $MgCO_3$, all sizes	1.25
Waukesha, Wis.—90% thru 100 mesh, 4.50; 50% thru 100 mesh	2.25

Pulverized Limestone for Coal Operators

Hillsville, Penn., sacks, 4.50; bulk	3.00
Joliet, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$; 95% thru 100 mesh; paper bags	3.50
Marblehead, Ohio — Analysis, 83.54% $CaCO_3$; 14.92% $MgCO_3$; 99.8% thru 100 mesh; sacks	4.25
Piqua, Ohio, sacks, 4.50@5.00; bulk	3.00@ 3.50
Rocky Point, Va.—85% thru 200 mesh, bulk	2.25@ 3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.50

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

Buffalo, N. Y.	2.00@ 2.50
Cedarville and S. Vineland, N. J.	2.25
Estill Springs and Sewanee, Tenn.	1.50
Franklin, Penn.	2.00
Gray Summit and Klondike, Mo.	1.75@ 2.00
Klondike, Mo.	2.00
Los Angeles, Calif.—Washed	5.00
Massillon, Ohio	3.00
Mendota, Va.	2.25@ 2.50
Michigan City, Ind.	.35
Mineral Ridge and Ohlton, Ohio	2.50
Oceanside, Calif.	3.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Pittsburgh, Penn.	3.00@ 4.00
Red Wing, Minn.	1.50
Rockwood, Mich.	2.75@ 3.25
Round Top, Md.	2.00
San Francisco, Calif.	4.00@ 5.00
Silica, Va.	2.00@ 2.50
St. Louis, Mo.	2.00
Sewanee, Tenn.	1.50
Utica and Ottawa, Ill.	.75@ 1.00
Zanesville, Ohio	2.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio		1.75
Chippewa Falls, Wis.		.25*

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Ambridge & So. H'g'ts, Penn.	1.25	1.25	1.15	.85	.85	.85
Asbury Park, Farmingdale, Spring Lake and Wayside, N.J.	.65	.55	1.00	1.35	1.40	
Attica and Franklinville, N. Y.	.95	.95	.95	.95	.95	.95
Boston, Mass.‡	1.40	1.40	2.25		2.25	2.25
Buffalo, N. Y.	1.10	1.05	1.05	1.05		1.05
Erie, Penn.	.60				1.40	
Machias Jct., N. Y.	.85	.65	.65		.65	.65
Montoursville, Penn.	1.00	.85	.75	.75	.75	.75
Northern New Jersey	.50	.50	1.25	1.25	1.25	
Portland, Me.	1.00	1.00	2.50		2.25	
Somerset, Penn.		2.00				
Washington, D. C.	.60@ .75	.60@ .75	1.70	1.50	1.30	1.30
CENTRAL:						
Attica, Ind.			All sizes .75@.85			
Aurora, Moronts, Oregon, Sheridan, Yorkville, Ill.	.25@ .80	.50@ .70	.10@ .40	.50@ .70	.60@ .80	.60@ .80
Barton, Wis.		.55	.75	.75	.75	.75
Chicago district, Ill.	.70	.55	.55	.60	.60	.60
Columbus, Ohio		.85	.85	.85	.85	
Des Moines, Iowa		.30	1.30	1.30	1.30	1.30
Eau Claire, Chippewa Falls, Wis.		.50	.70		.95	
Elkhart Lake, Wis.		.50	.50	.60	.50	.60
Ferrysburg, Mich.		.50@ .80	.60@1.00	.60@1.00		.50@1.25
Grand Haven, Mich.		.60@ .80	.70@ .90	.70@ .90		.70@ .90
Grand Rapids, Mich.	.50	.50	.90	.80	.70	.70
Hamilton, Ohio		1.00	1.00	1.00	1.00	
Hersey, Mich.		.50		.70		.70
Humboldt, Iowa	.35@ .50	.35@ .50	1.35@1.50	1.35@1.50	1.35@1.50	1.35@1.50
Indianapolis, Ind.	.60	.60		.90	.75@1.00	.75@1.00
Joliet, Plainfield & Hammond, Ill.	.60	.50	.50	.60	.60	.60
Mason City, Iowa	.50@ .60	.50@ .60	1.30	1.30	1.20	1.20
Mankato, Minn.		.45		1.25	1.25	1.25
Mattoon, Ill.			.75@.85 all sizes			
Milwaukee, Wis.	.96	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn.	.65*	.65*	1.75*	1.75*	1.75*	1.75*
Moline, Ill.	.60@ .85	.60@ .85	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
St. Louis, Mo.	1.20e	1.45f	1.55a	1.45	1.45	1.45
St. Paul, Minn.	.35	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.85	.85	.85	.85	.85	.85
Waukesha, Wis.		.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	1.50	1.25	1.25	1.15
SOUTHERN:						
Brewster, Fla.	.45	.45	3.00			
Brookhaven, Miss.	1.25	.70	1.25	1.00	.70	.70
Charleston, W. Va.			River sand and gravel, all sizes, 1.40			
Eustis, Fla.		.50				
Ft. Worth, Texas						.85
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	1.20
Macon, Ga.	.50	.50				
New Martinsville, W. Va.	1.00	.90@1.00		1.30@1.40		.80@ .90
Roseland, La.	.25	.15	1.25	.85	.45@ .65	
WESTERN:						
Kansas City, Mo.		.70@ .75				
Crushton, Durbin, Kincaid, Largo, Rivas, Calif.	.10@ .40	.10@ .40	.50@1.00	.50@1.00	.50@1.00	.50@1.00
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Phoenix, Ariz.	1.25	1.00	1.50	1.25	1.10	1.00
Pueblo, Colo.	.80	.60		1.20		1.15
San Diego, Calif.		.40@ .50	.80@1.00	.80@1.00	.65@ .80	.65@ .80
Seattle, Wash.	1.00	1.00	1.00	1.00	1.00	1.00
Steilacoom, Wash.	.50	.50	.50	.50	.50	.50

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
Algonquin and Beloit, Wis.			Dust to 3 in., .40			
Brookhaven, Miss.						.60
Buffalo, N. Y.	1.10	.95		.85		.85
Des Moines, Iowa	.50					
Dresdon, Ohio	.60@ .75	.70	.60	.80	.75	.65
East Hartford, Conn.	.85*d					
Eau Claire, Chippewa Fls., Wis					.65	
Ft. Worth, Texas						.85
Gainesville, Texas						.55
Grand Rapids, Mich.				.50		
Hamilton, Ohio					1.00	
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, at .65			
Macon, Ga.	1.25‡					
Mankato, Minn.	.30					
Moline, Ill. (b)	.60	.60	Concrete gravel, 50% G., 50% S., 1.00			
Oregon City, Ore.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*
Somerset, Penn.		1.85@2.00		1.50@1.75		
Steilacoom, Wash.	.25					
St. Louis, Mo.			Mine run gravel, 1.55 per ton			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.54
Winona, Minn.	.60	.60	.60	.60	.60	.60
York, Penn.	1.10	1.00				

*Cubic yd. ‡Delivered on job by truck. (a) ⅝-in. down. (b) River run. (c) 2½-in. and less ¶By truck only. (d) Delivered in Hartford, Conn., $1.50 per yd. (e) Mississippi River. (f) Meramec River.

Core and Foundry Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. producing plant.

City or shipping point	Molding, fine	Molding, coarse	Molding, brass	Core	Furnace lining	Sand blast	Stone sawing
Aetna, Ill.				.30@ .35			
Albany, N. Y.	2.75	2.75	2.75	1.00@2.75		1.75@4.50	
Arenzville, Ill.	1.50@1.75			1.00			
Beach City, Ohio	1.75	1.75		1.75	1.75@2.00		
Buffalo, N. Y.	1.50	1.50		2.00@2.50			
Cedarville and S. Vineland, N. J.				2.25			
Columbus, Ohio	1.50@2.00	1.25@1.50	2.00	.30	1.75@2.00	2.75@4.50	
Dresden, Ohio	1.50@1.75	1.25@1.50	1.50@1.75	1.25			
Eau Claire, Wis.						3.00	
Elco & Tamms, Ill.	Ground silica per ton in carloads—18.00@31.00						
Estill Springs and Sewanee, Tenn.	1.25			1.25		1.35@1.50	
Franklin, Penn.	1.75	1.75		1.75			
Kasota, Minn.							1.00
Klondike, Mo.				2.00	2.00		2.00
Massillon, Ohio	2.25	2.25		2.50	2.50		
Mendota, Va.	Ground flint or silex—16.00@20.00 per ton						
Michigan City, Ind.				.30@ .35			
Millville, N. J.				1.75b		3.50	
Montoursville, Penn.				1.35@1.50			
New Lexington, O.	1.75	1.25					
Ohlton, Ohio	1.75b	1.75b		2.00b	1.75b	1.75b	
Ottawa, Ill.						3.50	
Red Wing, Minn. (d)					1.50	3.00	1.50
Round Top, Md.				1.60		2.25	
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50@5.00†	3.50@5.00†	3.50@5.00†	
Silica, Va.	Potters' flint, 7.00@12.00						
Utica & Ottawa, Ill.	.40@1.00f	40.@1.00f	.75@1.00	.40@1.00f	.60@1.00f	2.23@3.25	1.00@3.25
Utica, Ill.	.60	.70		.75	1.00		
Utica, Penn.	1.75	1.75		2.00			
Warwick, Ohio	1.50*2.00	1.50*@2.00	1.75	1.50*@2.00	1.50*@2.00		
Zanesville, Ohio	2.00	1.50	2.00	2.00	2.00		

*Green. †Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (b) Damp. (c) Shipped from Albany. (d) Filter sand, 3.00. (e) Filter sand, 3.00@4.25. (f) Crude and dry.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Buffalo, N. Y., Erie and Dubois, Pa.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Penn.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Northern N. J.	2.50	1.20	1.50	1.20	1.20	1.20	1.20
Reading, Penn.	2.50	1.25		1.50			
Western Penn.	2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	
Toledo, Ohio	1.50	1.35	1.35	1.35	1.35	1.35	1.35
Youngst'n, O., dist.	2.00	1.25	1.35	1.35	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.		1.45*		1.45*	1.45*	1.45*	
Ensley and Alabama City, Ala.	2.05	.80	1.35	1.25	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.15
Woodward, Ala.	2.05*	.80*	1.35*	1.25*	.90*	.90*	

*5c per ton discount on terms.

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.			12.00					2.00
Buffalo, N. Y.		12.00	12.00	12.00			10.00	1.95[4]
Chazy, N. Y.		8.50	7.50	10.00		15.50[1]	8.50	14.00
Lime Ridge, Penn.					5.00[2]			
Pittsburgh, Penn.	11.50	8.50	8.50		9.00	11.00	8.00	
West Stockbridge, Mass.	12.00	10.00	5 60					2.00[12]
Williamsport, Penn.			10.00				6.00	
York, Penn., & Oranda, Va.	11.50[7]	8.50@9.50[7]	8.50@9.50[7]	8.50@10.50[7]	8.00	9.25	7.00	1.40[5]
CENTRAL:								
Afton, Mich.							7.80	1.35
Carey, Ohio	11.50	7.50	7.50		9.00		8.00	1.50
Cold Springs, Ohio		8.50	8.50				8.00	
Cold Springs and Gibsonburg, Ohio	11.50	8.50	8.50		9.00	11.00		
Huntington, Ind.	12.50	8.50	8.50		9.00		8.00	
Luckey, Ohio[6]	11.50							
Milltown, Ind.		8.50@10.00		10.00[8]			8.50[22]	1.35[10]
Scioto & Marble Cliff, O.		8.50	8.50	8.50	8.25	.62½	7.50	1.50[3]
Sheboygan, Wis.		10.50					9.50	2.00[4]
Wisconsin points[6]		11.50					9.50	
Woodville, Ohio	11.50	8.50	8.50	12.50	8.00	10.00[9]	9.00	1.50[3]
SOUTHERN:								
Allgood, Ala.	12.50	10.00			8.50		8.50	1.50
El Paso, Texas							7.00	1.50
Frederick, Md.		9.00	9.00	9.50	7.50	9.00	7.50	9.00
Graystone, Ala.	12.50	10.00		12.50		1.40[14]	8.50	1.50
Keystone, Ala.		10.00	8.00	10.00	8.00		8.00	1.50
Knoxville, Tenn.	20.25	8.50	8.50	8.50			7.50	1.25
Ocala, Fla.		11.50	10.00				12.00	1.30
Saginaw, Ala.	12.50	10.00	9.00	10.00			8.50	1.50
WESTERN:								
Fairland, N. M.							15.00	
Limestone, Wash.	15.00	15.00	10.00	15.00	16.50	16.50	16.50	2.09
Los Angeles, Calif.	16.00		16.00	16.00			16.00	
San Francisco, Calif.	20.00	20.00	13.50	21.00			14.50[20]	2.15
Tehachapi, Calif.[13]	17.00	15.00	12.00@15.00[11]	17.00	16.00		16.00	2.00
Seattle, Wash.	19.00	19.00	12.00	19.00	19.00		18.60	2.30

[1] Barrels. [2] Net ton. [3] Wooden, steel 1.70. [4] Steel. [5] 180 lb. [6] Dealers' prices, net 30 days less 25c discount per ton on hydrated lime and 5c per bbl. on lump if paid in 10 days. [7] In paper bags, including bags. [8] To 11.00. [9] 80-lb. [10] To 1.50. [11] Refuse or air slack, 10.00@12.00. [12] To 3.00. [13] Delivered in Southern California. [14] Per 2 bags of 90 lb. each. [22] To 9.00. [20] To 16.50.

Miscellaneous Sands

(Continued)

City or shipping point	Roofing Sand	Traction
Columbus, Ohio		.15@ .30
Dresden, Ohio		1.25
Eau Claire, Wis.	4.25	
Estill Springs and Sewanee, Tenn.	1.35@ 1.50	1.35@ 1.50
Massillon, Ohio		2.00
Michigan City, Ind.		.30
Montoursville, Penn.		1.10
Ohlton, Ohio	*1.75@ 2.00	*1.75
Red Wing, Minn.		1.00
Round Top, Md.	2.25	1.75
San Francisco, Calif.	3.50	3.50
Utica & Ottawa, Ill.	1.00@ 3.25	.75
Warwick, Ohio		2.00
Zanesville, Ohio		2.50

*Damp.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Baltimore, Md.:	
Crude talc (mine run)	3.00@ 4.00
Ground talc (20-50 mesh), bags	10.00
Cubes	55.00
Blanks (per lb.)	.08
Pencils and steel crayons, gross	1.00@ 2.80
Chatsworth, Ga.:	
Crude talc, grinding	5.00
Ground talc (20-50 mesh), bags	9.00
Ground talc (150-200 mesh)	10.00
Pencils and steel crayons, per gross	1.50@ 2.50
Chester, Vt.:	
Ground talc (150-200 mesh), paper bags	9.00@10.00
Same, burlap bags, bags extra	8.00@ 9.00
Chicago and Joliet, Ill.:	
Ground (150-200 mesh), bags	30.00
Dalton, Ga.:	
Crude talc (for grinding)	5 00
Ground talc (150-200 mesh), bags	12.00
Pencils and steel worker's crayons, per gross	1.00@ 2.50
Emeryville, N. Y.:	
(Double air floated) including bags;	
325 mesh	14.75
200 mesh	13.75
Glendon, N. C.:	
Ground talc (150-200 mesh), bulk	6.00@10.00
Ground talc (150-200 mesh), bags	8.00@14.00
Pencils and steel crayons, gross	1.05@ 2.00
Blanks, .08 per lb.; cubes	50.00
Hailesboro, N. Y.:	
Ground white talc (double and triple air floated) 200-lb. bags, 300-350-mesh	15.50@20.00
Henry, Va.:	
Crude (mine run)	3.50@ 4.00
Ground talc (150-200 mesh), bags	9.50@14.50
Joliet, Ill.:	
Ground talc (200 mesh, grey), bags	10.00
Ground talc (200 mesh, white), bags	20.00
Keeler, Calif.:	
Ground (200-300 mesh), bags	20.00@30.00
Natural Bridge, N. Y.:	
Ground talc (300-325 mesh), bags	12.00@15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock	
Columbia, Tenn.—B.P.L. 65-70%	3.50@ 4.50
Gordonsburg, Tenn.—B.P.L. 65-68%	3.75@ 4.25
Mt. Pleasant, Tenn.—B.P.L. 72%	5.00@ 5.50
Tennessee — F.o.b. mines, gross ton, unground brown rock, B.P.L. 72%	5.00
B.P.L. 75%	6.00
Twomey, Tenn.—B.P.L. 65%, 2000 lb.	8.00@ 9.00
Ground Rock (2000 lb.)	
Centerville, Tenn.—B.P.L. 65%	8.00
Gordonsburg, Tenn.—B.P.L. 65-70%	4.00@ 4.50
Mt. Pleasant, Tenn.—B.P.L. 72.5%	9.50
Twomey, Tenn.—B.P.L. 65%	8.00@ 9.00

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida — F.o.b mines, gross ton, 68/66% B.P.L., Basis 68%	3.25
70% min. B.P.L., Basis 70%	3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton	125.00
Punch mica, per lb.	.06
Scrap, per ton, carloads	20.00
Rumney Depot, N. H.—Per ton,	
Mine run	300.00
Clean shop scrap	25.00
Mine scrap	22.50@24.00
Roofing mica	37.50
Punch mica, per lb.	.12
Cut mica—50% from Standard List.	

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Barton, Wis., f.o.b. cars	.....	10.50
Brandon, Vt. — English pink, English cream and coral pink	*12.50	*12.50
Brandon grey	*12.50	*12.50
Brighton, Tenn.— All colors and sizes	§3.00	§3.00
Buckingham, Que.—Buff stucco dash	.....	12.00@14.00
Chicago, Ill. — Stucco chips, in sacks, f.o.b. quarries	.....	17.50
Crown Point, N. Y.— Mica spar	.....	9.00@10.00
Dayton, Ohio	.....	6.00@24.00
Easton, Penn.— Green stucco	.....	12.00@18.00
Green granite	.....	14.00@20.00
Haddam, Conn.—Felstone buff	15.00	15.00
Harrisonburg, Va.—Bulk marble (crushed, in bags)	†12.50	†12.50
Ingomar, Ohio—Concrete facings and stucco dash	.....	10.00@20.00
Middlebrook, Mo.—Red	.....	20.00@25.00
Middlebury, Vt.—Middlebury white	‡9.00	‡9.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	.....	5.50@ 7.50
Milwaukee, Wis.	.....	14.00@34.00
New York, N. Y.—Red and yellow Verona	.....	32.00
Phillipsburg, N. J.— Royal green granite	.....	15.00@18.00
Randville, Mich.— Crystalite crushed white marble, bulk	4.50@ 6.00	4.50@ 7.50
Rose pink granite, bulk	.....	12.00
Stockton, Calif.—"Natrock" roofing grits	.....	12.00@18.00
Tuckahoe, N. Y.—Tuckahoe white	12.00	.....
Wauwatosa, Wis.	.....	20.00@32.00
Wellsville, Colo. — Colorado Travertine Stone	15.00	15.00

*Carloads, including bags; L.C.L. 14.50.
†C.L. L.C.L. 17.00.
‡Carloads, including bags; L.C.L. 10.00.
§Bulk, car lots, minimum 30 tons.

Potash Feldspar

Auburn and Topsham, Me. — Color white, 98% thru 140-mesh	19.00
Bristol, Tenn.—Color, white; analysis, K_2O, 6 to 10%; Na_2O, 2½ to 4%; SiO_2, 68 to 78%; Fe_2O_3, 12 to 20%; Al_2O_3, 16.5 to 18.5%; 99% thru 200 mesh; bulk, depending on grade	14.50@18.00
Buckingham, Ore.—White, analysis, K_2O, 12-13%; Na_2O, 1.75%; bulk	9.00
De Kalb Jct., N. Y.—Color, white, bulk (crude)	9.00
East Hartford, Conn.—Color, white, 95% thru 60 mesh, bags	16.00
96% thru 150 mesh, bags	28.00
East Liverpool, Ohio—Color, white; 98% thru 200 mesh, bulk	19.35
Soda feldspar, crude, bulk, per ton	22.00
Glen Tay Station, Ont.—Color, red or pink; analysis, K_2O, 12.81%; crude	7.00
Keystone, S. D.—White; bulk (crude)	8.00
Los Angeles, Calif.—Color, white; analysis, K_2O, 12.16%; Na_2O, 1.53%; SiO_2, 65.60%; Fe_2O_3, .10%; Al_2O_3, 19.20%; crude, bags, 10.00@12.00; bulk	9.00@11.50
Pulverized, 95% thru 200 mesh; bags, 19.73@22.00; bulk	15.83@20.00
Murphysboro, Ill.—Color, prime white; analysis, K_2O, 12.60%; Na_2O, 2.35%; SiO_2, 63%; Fe_2O_3, .06%; Al_2O_3, 18.20%; 98% thru 200 mesh; bags, 21.00; bulk	20.00
Penland, N. C.—White; crude, bulk	8.00
Ground, bulk	16.50
Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; Si_2O, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; bulk	18.00
Crude	9.00
Tenn. Mills—Color, white; analysis K_2O, 10%; Na_2O_3, 3%; 68% SiO_3; 99½% thru 200 mesh; bulk (Bags, 15c extra)	18.00
Toronto, Can.—Color, flesh; analysis K_2O, 12.75%; Na_2O, 1.96%; crude	7.50@ 8.00

Chicken Grits

Afton, Mich.(Limestone), per ton	1.75
Belfast, Me.—(Limestone), per ton	‡10.00
Brandon, Vt.	10.00
Cartersville, Ga.—(Limestone), per bag	2.25
Centerville, Iowa—(Gypsum), per ton	18.00
Chico and Bridgeport, Tex.—Hen	¶9.00
Baby chick, per ton	¶8.00
Danbury, Conn.—(Limestone), bulk	‡7.50@*9.00
Easton, Penn.—Per ton, bulk	3.00
Joliet, Ill.—(Limestone), bags, per ton	4.50
Knoxville, Tenn.—Per bag	1.25
Los Angeles, Calif.—(Feldspar), per ton	15.00
Gypsum, Ohio—(Gypsum), per ton	10.00
Hartford, Conn.	‡7.50@*9.00
Limestone, Wash. — (Limestone), per ton	12.50
Los Angeles, Calif. (including sacks)	12.00
Marion, Va.—(Limestone), bulk, 5.00; bagged, 6.50; 100-lb. bag	.50
Middlebury, Vt.—Per ton	10.00
Rocky Point, Va.—(Limestone), 100-lb. bags, 50c; sacks, per ton, 6.00; bulk	5.00
Seattle, Wash.—(Limestone), bulk, per ton	10.00
Warren, N. H.—(Mica), per ton	3.85@ 3.90
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.—(Limestone), bulk	‡7.50@*9.00
Wisconsin Points—(Limestone), per ton	15.00

*L.C.L. †Less than 5-ton lots. ‡C.L. ¶100-lb. bags.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	9.00
Anaheim, Calif.	10.50@11.00
Barton, Wis.	10.50
Boston, Mass.	17.00*
Brighton, N. Y.	19.75*
Brownstone, Penn.	11.00
Dayton, Ohio	12.50@13.50
Detroit, Mich.	13.00@14.00
Farmington, Conn.	13.00
Flint, Mich.	¶12.00@17.50*
Grand Rapids, Mich.	12.50
Hartford, Conn.	14.00@19.00*
Jackson, Mich.	12.25
Lakeland, Fla.	10.00@11.00
Lake Helen, Fla.	9.00@12.00
Lancaster, N. Y.	12.25
Madison, Wis.	12.50a
Michigan City, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	12.75@16.50‡
New Brighton, Minn.	10.00
Pontiac, Mich.	19.75
Portage, Wis.	16.00
Prairie du Chien, Wis.	18.00@22.50
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	16.00
Sebewaing, Mich.	12.50
Sioux Falls, S. Dak.	13.00
South River, N. J.	13.00
Syracuse, N. Y.	16.00@18.00
Toronto, Canada	13.50@16.00*†
Wilkinson, Fla.	12.00@16.00
Winnipeg, Canada	14.00

*Delivered on job. †5% disc., 10 days. ¶Dealers' price. (a) Less 50c discount per M., 10 days. ‡L.C.L.

Portland Cement

Prices per bag and per bbl., without bags, net in carload lots.

	Per Bag	Per Bbl.
Albuquerque, N. M.	.86¾	3.47
Atlanta, Ga.	.....	2.35
Baltimore, Md.	.....	2.15@2.25
Birmingham, Ala.	.....	**2.10**
Boston, Mass.	.....	2.13@2.23
Buffalo, N. Y.	.....	2.20@2.30
Butte, Mont.	.90¼	3.61
Cedar Rapids, Iowa	.....	2.24
Charleston, S. C.	.....	2.35
Cheyenne, Wyo.	.82¾	3.31
Cincinnati, Ohio	.....	2.22
Cleveland, Ohio	.....	2.24
Chicago, Ill.	.51¼	2.05
Columbus, Ohio	.57¼	2.29
Concrete, Wash.	.....	2.35
Dallas, Texas	.....	2.00
Davenport, Calif.	.....	2.45*
Davenport, Iowa	.....	2.24
Dayton, Ohio	.58¼	2.33
Denver, Colo.	.66¼	2.65
Des Moines, Iowa	.....	2.05
Detroit, Mich.	.....	1.90
Duluth, Minn.	.....	2.04
Houston, Texas	.....	2.00
Indianapolis, Ind.	.54¾	2.19
Jackson, Miss.	.....	2.30
Jacksonville, Fla.	.....	2.20
Jersey City, N. J.	.....	2.03@2.13
Kansas City, Mo.	.....	1.92
Los Angeles, Calif.	.60	2.40
Louisville, Ky.	.55½	2.22
Memphis, Tenn.	.....	2.10
Milwaukee, Wis.	.....	2.00@2.20
Minneapolis, Minn.	.....	2.12@2.22
Montreal, Que.	.....	1.36
New Orleans, La.	.....	**2.07**
New York, N. Y.	.....	1.93@2.03
Norfolk, Va.	.....	2.07
Oklahoma City, Okla.	.....	2.46
Omaha, Neb.	.....	2.36
Peoria, Ill.	.....	2.22
Philadelphia, Penn.	.....	2.11@2.21
Phoenix, Ariz.	.....	**3.26**
Pittsburgh, Penn.	.....	2.04
Portland, Colo.	.....	2.80
Portland, Ore.	.....	2.70‡
Reno, Nev.	.....	2.91
Richmond, Va.	.....	2.24@2.34
Salt Lake City, Utah	.70¼	2.81
San Francisco, Calif.	.....	2.21
Savannah, Ga.	.....	2.50
St. Louis, Mo.	.51¼	2.05
St. Paul, Minn.	.....	2.12@2.22
Seattle, Wash.	.....	2.50†@2.65
Tampa, Fla.	.....	2.25
Toledo, Ohio	.....	2.20
Topeka, Kan.	.....	2.41
Tulsa, Okla.	.....	2.33
Wheeling, W. Va.	.....	2.12
Winston-Salem, N. C.	.....	2.44

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.
Albany, N. Y.	.43¾	1.75
Buffington, Ind.	.....	1.80
Chattanooga, Tenn.	.....	2.45*
Concrete, Wash.	.....	2.35
Davenport, Calif.	.....	2.45*
Detroit, Mich.	.....	2.15
Hannibal, Mo.	.....	1.90
Hudson, N. Y.	.....	1.75
Leeds, Ala.	.....	1.65
Lime and Oswego, Ore.	.....	2.70‡
Mildred, Kan.	.....	2.35
Nazareth, Penn.	.....	2.15
Northampton, Penn.	.....	1.75
Richard City, Tenn.	.....	2.05
Steelton, Minn.	.....	1.85
Toledo, Ohio	.....	2.20
Universal, Penn.	.....	1.80

NOTE—Add 40c per bbl. for bags.

*Includes sacks.
†10c discount, 10 days. ‡10c discount, 15 days.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gauging Plaster	Wood Fiber	Gauging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48". Lengths 6'-10'. Per M Sq. Ft.
Arden, Nev., and Los Angeles, Calif.	3.00	8.00u	8.00u	10.70u	10.70u	.....	.....	.....	.....	11.70u	.....	.....	.....
Centerville, Iowa	3.00	10.00	15.00	10.00	10.00	10.50	13.50	.....	.....	13.50	.....	.....	.....
Des Moines, Iowa	3.00	8.00	9.00	10.00	10.00	10.50	13.50	12.00	24.00	22.00	18.00	21.00	30.00
Detroit, Mich.	.....	.....	.....	.....	14.30o	12.30m	.....	m9.00@11.00o	.....	.....	.....	.....	.....
Delawanna, N. J.	.....	.....	.....	.....	.....	12.50	.....	8.25	.....	.....	14.00	15.00	33.61
Douglas, Ariz.	.....	.....	6.00	14.50	15.00	.....	18.00	.....	30.00	.....	.....	.....	.....
Grand Rapids, Mich.	2.75	6.00	6.00	8.00	9.00	9.00	17.50	.....	24.55	20.00	.....	.....	.....
Gypsum, Ohio	3.00	4.00	6.00	7.00	9.00	9.00	18.00	7.00	27.50	19.00	.....	.....	.....
Los Angeles, Calif.	.....	.....	7.50@9.50	11.50y	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port Clinton, Ohio	3.00	4.00	6.00	10.00	9.00	9.00	21.00	7.00	30.15	20.00	.....	20.00	30.00
Portland, Colo.	.....	.....	.....	10.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	9.00	13.40	14.40	.....	15.40	.....	.....	.....	.....	.....	.....
Seattle, Wash.	6.60	10.00	10.00	13.00	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sigurd, Utah	.....	.....	.....	.....	.....	.....	.....	.....	21.50	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00	33.00

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable).
(m) Includes paper bags; (o) includes jute sacks; (u) includes sacks; (y) sacks 15c extra, rebated.

Market Prices of Cement Products

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point

City or shipping point	Sizes 8x8x16	8x10x16	8x12x16
Camden, N. J.	17.00	.....	.....
Cement City, Mich.		5x8x12—55.00¶	
Columbus, Ohio	16.00	.....	.....
Detroit, Mich. (d)	.16	.....	.18
Forest Park, Ill.	21.00*	.....	.....
Grand Rapids, Mich.	.16@ .18	.....	.....
Graettinger, Iowa	.16@ .18	.....	.....
Indianapolis, Ind	.10@ .12a	.....	.....
Los Angeles, Calif.¶	5¾x3½x12—55.90	7¾x3½x12—65.00	
Oak Park, Ill.	20.00	.....	.....
Olivia and Mankato, Minn.	9.50b	.....	.....
Somerset, Penn.	.18@ .20	.....	.....
Tiskilwa, Ill.	.16@ .18†	.....	.....
Yakima, Wash.	20.00*	.....	.....

*Price per 100 at plant. †Rock or panel face. (a) Face. ‡Delivered. ¶Price per 1000. (b) Per ton. (c) Plain. (d) 5x8x12—65.00 M, 5½x8x12—68.50 M.

Cement Roofing Tile

Prices are net per sq. in. carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—8x12, per sq.

Red	15.00
Green	18.00
Chicago, Ill.—Per sq.	20.00

Cicero, Ill.—Hawthorne roofing tile, per sq.

	Chocolate, Red, Yellow, Gray, and Orange	Green, Blue
French and Spanish†	$11.50	$13.50
Ridges (each)	.25	.35
Hips	.25	.35
Hip starters	.50	.60
Hip terminals, 2-way	1.25	1.50
Hip terminals, 4-way	4.00	5.00
Mansard terminals	2.50	3.00
Gable finials	1.25	1.50
Gable starters	.25	.35
Gable finishers	.25	.35

†Price per square.

Houston, Texas—Roofing Tile, per sq.	25.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Waco, Texas:	Per sq.
4x4	.60

Cement Building Tile

Cement City, Mich.:	Per 100
5x8x12	5.00
Columbus, Ohio:	
5x8x12	6.50
Grand Rapids, Mich.:	
5x8x12	8.00
5x4x12	4.50
Longview, Wash.:	
4x6x12	5.00
4x8x12	6.25
Mt. Pleasant, N. Y.:	Per 100
5x8x12	78.00
Grand Rapids, Mich.:	Per 100
5x8x12	7.00
Houston, Texas:	
5x8x12 (Lightweight)	80.00
Pasadena, Calif. (Stone Tile):	Per 100
3½x4x12	3.00
3½x6x12	4.00
3½x8x12	5.50
Tiskilwa, Ill.:	Per 100
8x8	15.00
Wildasin Spur, Los Angeles, Calif. (Stone-Tile):	Per 1000
3½x6x12	50.00
3½x8x12	60.00
Prairie du Chien, Wis.:	
5x8x12	82.00
5x4x12	46.00
5x8x 6 (half-tile)	41.00
5x8x10 (fractional)	82.00
Yakima, Wash. (Building Tile):	
5x8x12	.10

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .13; 12-in., .17½; 14-in., .25; 16-in., .32; 18-in., .40; 20-in., .50; 24-in., .80; 26-in., 1.00; 28-in., 1.10; 30-in.	1.25
Longview, Wash.—Drain tile, per foot: 3-in., .05; 4-in., .06; 6-in., .10; 8-in., .15; 10-in.	.20
Olivia and Mankato, Minn.—Cement drain tile, per ton	8.00
Tacoma, Wash.—Drain tile, per ft.:	
3 in.	.04
4 in.	.05
6 in.	.07½
8 in.	.10
Waukesha, Wis.—Drain tile, per ton	8.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	22.00	25.00@40.00
Baltimore, Md. (Del. according to quantity)	15.50	22.00@50.00
Camden and Trenton, N. J.	17.00	.....
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	14.50	22.50@33.50
Eugene, Ore.	25.00	35.00@75.00
Forest Park, Ill.	.....	37.00
Friesland, Wis.	22.00	32.00
Longview, Wash.*	15.00	22.50@65.00
Milwaukee, Wis.	14.00	30.00
Mt. Pleasant, N. Y.	.....	14.00@23.00
Oak Park, Ill.	.....	42.00
Omaha, Neb.	18.00	30.00@ 40.00
Pasadena, Calif.	10.00	.....
Philadelphia, Penn.	14.75	20.00
Portland, Ore.	17.50	23.00@55.00
Mantel brick—100.00@150.00		
Prairie du Chien, Wis.	14.00	22.50@ 25.00
Rapid City, S. D.	17.00	25.00@ 35.00
Waco, Texas	16.50	32.50@125.00
Watertown, N. Y.	20.00	35.00
Westmoreland Wharves, Penn.	14.75	20.00
Winnipeg, Man.	14.00	22.00
Yakima, Wash.	22.50	.....

*40% off List.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8 in.	10 in.	12 in.	15 in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Detroit, Mich.								15.00 per ton									
Grand Rapids, Mich. (b)																	
Culvert pipe	.....	.....	.....	.60	.72	1.00	1.28	1.60†	.....	1.92	2.32	3.00	4.00	5.00	6.00	.....	.....
Sewer pipe (d)	.....	.....	.....	.....	.63	.....	.....	.60†	.....	.....	.....	.58	.....	.....	.....	.....	.....
Houston, Texas	.....	.19	.28	.43	.55½	.90	1.30	.....	1.70†	2.20	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind. (a)	.....	.....	.....	.80	.90	1.10	1.30	.....	.....	1.70	.....	2.70	.....	.....	.....	.....	.....
Longview, Wash.							Sewer pipe 40% off list; culvert—list										
Mankato, Minn. (b)	.....	.....	.....	.....	.....	.....	.....	.....	.....	1.50	1.75	2.50	3.25	4.25	.....	.....	.....
Newark, N. J.							6 in. to 24 in., $18.00 per ton										
Norfolk, Neb. (b)	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Olivia, Mankato, Minn.							12.00 per ton										
Paullina, Iowa‡	.....	.....	.....	.....	.....	.....	.....	2.25	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Somerset, Penn.	.....	.....	.....	.....	1.08	1.25	1.65	.....	.....	2.50	.....	3.65	4.85	7.50	8.50	.....	.....
Tiskilwa, Ill. (rein.)	.....	.....	.....	.75	.85	.95	1.20	1.70	.....	2.00	.....	2.75	3.40	.....	6.50	.....	.....
Wahoo, Neb. (b)	.....	.....	.....	.....	1.00	1.13	1.10	1.60	.....	1.90	.....	2.25	3.40	.....	5.50	.....	.....
Yakima, Wash.							1.42	.....	.....	2.11	.....	2.75	3.58	4.62	6.14	6.96	7.78
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

(a) 24-in. lengths; (b) Reinforced; (d) Eastern clay, list, 72% and 60% off.
†21-in. diam. ‡Price per 2-ft. length.

Huron Portland Reduces Cement Prices in Michigan

AN announcement has recently come from the Huron Portland Cement Co., Detroit, Mich., stating that the company has again reduced the price on Huron, New Wyandotte and Ford portland cement in the Michigan area. The Huron company made a reduction of 15 cents per barrel in September, 1927, and with the present cut of 10 cents a barrel, which became effective on Jan. 18, 1928, this makes a total voluntary reduction of 25 cents within the last four months.

The company's announcement states that the September reduction was made to provide a wider margin to dealers without making it necessary for them to raise their prices, and also to stimulate business in Michigan and the nearby states. Finding that the first reduction was a success in that it did help the dealers and speed up building, the company decided upon the further reduction which has now become effective.

Rhode Island Dealers Join Fight Against Foreign Cement

IN the fight being waged over the whole country against the use of foreign cement, one of the most recent developments is the work of the building material dealers of Providence, R. I., in getting to the public the facts of the case. The city of Providence and the whole state of Rhode Island have always specified American made cement for public construction work, but recently political influences overruled that condition. The particular case was in the construction of a new junior high school where the specifications called for American cement, but this restriction was later withdrawn and foreign cement was used. Fearing that this attitude might be continued in other public jobs, the local dealers, working in conjunction with the Cement Information Bureau, of New York, brought the situation to the public eye by means of advertisements in the four papers of Providence. The advertisements, headed "Exporting American Prosperity," stated clearly why foreign cement, produced under wage conditions which would be intolerable in this country, can be sold in competition with the home product.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Northwest Concrete Products Association Meets at Portland, Oregon

Proceedings and Abstracts of Papers Presented at Third Annual Meeting

THE THIRD annual meeting of the Northwest Concrete Products Association held at the Multnomah Hotel, Portland, Ore., recently, brought together representative manufacturers of concrete products from 39 plants located in Oregon, Washington and California and some nationally prominent concrete specialists, who emphasized the increasing demand for constantly higher quality cement and concrete aggregates.

From the opening remarks and report of the executive committee given by President W. H. Sharp to the rising vote which carried the resolution of the association to in so far as possible use only American-made cement and other materials, the two-day meeting was by far the most successful enjoyed by this association.

In reviewing the past accomplishments of the association President Sharp called particular attention to the team work which had at all times been manifested by the officers. He cited that all advertising of the various member-plants have always contained only the truth and never a reference made to competitive products, and that they had endeavored to conduct their business on the single policy of a square deal to all. He also voiced the opinion that individuality of the members had been stimulated by their association, but also stated that no one man or concern today could stand alone. The association, he said, had made better financial progress than during the previous year.

Co-operation Praised

Secretary F. R. Zaugg issued a bulletin to the members outlining a proposed code of ethics for the association. This was well received and a committee appointed to consider it during the next six months and it was decided to adopt such a code at the next mid-summer meeting. Jack Collins, secretary-treasurer, reported that finances of the association were in good condition, and that delinquents were now at a minimum. A change was made in the by-laws on membership and it was decided to issue professional as well as honorary memberships in the association, which would be given to engineers and consultants at various times.

Advertising and Publicity

Earl Bracken of Aberdeen discussed advertising and publicity, advising that the

W. H. Sharp, re-elected president, Northwest Concrete Products Association

Washington Concrete Association had at all times co-operated with the association on advertising and recommended group advertising. It was stated that competitors intended to increase their advertising during the coming year and he recommended that the association carry on to the limit of their resources in this respect.

Mayor Geo. L. Baker addressed the delegates at the noon luncheon, stating that he had had occasion to follow very closely the development of the concrete industry and had noted nothing but progress of a great industry. He called attention to the time when concrete pipe was first introduced in Portland and that during the past 15 years it had been found very satisfactory. Also he took occasion to introduce to the members Clare Bullen, formerly of the Concrete Pipe Co., but now with the Mid-State Concrete Pipe Co. of Chicago, as the pioneer who first introduced the use of concrete pipe in Portland. E. C. Ballinger of Seattle made the response.

In a humorous vien the mayor stated, "Three years ago you were pretty green, but now from what I know about concrete in general and concrete pipe in particular that the longer you let it stand the harder it gets, I suppose the longer you associate together the harder you will get."

Products Industry Growing

One of the oustanding addresses of the convention was that of O. Laurgaard, city engineer, Portland, who cited his experience with concrete over a great many years, but especially in connection with the sewer construction in the city of Portland. He stated that the first pipe of this kind was laid by the city in 1880 and that it now leads the United States in its use. Several large sewers laid by the city in 1909 are still in use and show but slight deterioration. He called the attention of the manufacturers that they must at all times strive for quality product, especially the pre-cast concrete pipe, and that inspection would continue to be very rigid, and yet he was very well satisfied with the product thus far and that it compared favorably with vitrified clay. In some instances the product had been found from 10 to 50% better than specifications, especially in the smaller sizes.

Mr. Laurgaard predicted that business would be good for manufacturers in this section during the coming year on account of the amount of work already proposed. On account of the world renowned purity

of the water here no affects had been noted from acids in either sanitary or storm sewers, and no record of failure from this cause, he said. He stated their specifications called for the use of Columbia river sand only, and that each piece of pipe purchased must have the name of the manufacturer and the date thereon, and that the larger type pipe would be used in sewers hereafter. This was on account of four serious storms experienced during the year.

He cited that there were but few manufacturers of concrete blocks in the Pacific Northwest and believed they should be encouraged to locate in this section. All light posts on the city bridges and viaducts are constructed of concrete. He also called attention of the delegates to the advantages of this section of the northwest, including lumber, shipping, power, transcontinental railway system, highway systems and air travel, and above all the equable climate where industry may save from 15 to 20% in manufacturing costs over other centers.

In considering the time and place for the midsummer convention this year, the association was practically unanimous in accepting the invitation of Tacoma, which was given by E. L. Warner of the Greystone Concrete Co. A committee will decide later in the year as to whether the meeting will be in Tacoma at the Winthrop hotel or at Paradise Inn on Mt. Rainer, which seems to be the most popular.

Irrigation Pipe Offers Good Field

The address of E. E. Newell of Hood River, Ore., on "Irrigation Pipe and Specifications" was received with enthusiasm and close attention, this being rather a new field for the majority of the delegates.

According to Mr. Newell, it is found that irrigation at present is done more extensively in the humid sections west of the Cascades rather than in the arid sections of the east. While there is considerable rainfall, it is found that it is not properly distributed, and that irrigation during July and August has increased production of various crops at least 35%.

He gave figures showing that the hop growers had benefited considerably in using crude irrigation and were now ready to put in concrete irrigation pipe when its use had been properly explained. This has already been done to some extent in both the Willamette and Hood river valleys, and he predicted that the valleys to the north in Washington would soon follow their example and recommended that the pipe manufacturers make a study of this new angle of the business. Also that the manufacturer should supervise the installation and either superintend it themselves and have it installed by an expert; in other words, "Build well for future business. He urged them to better the organization, to at all times maintain prices sufficient to carry costs and make a reasonable profit and to charge for the job rather than by the pipe-foot. Also to educate the farmer that he was purchasing concrete with an indeterminate life, and to no longer consider wood which has a determinate life. He also gave figures on irrigation pipe that had stood up under rigid tests for from 10 to 16 years. He emphasized that this field is still virgin, and recommended that manufacturers produce to a large extent the tongue and groove irrigation pipe.

Mr. Newell also predicted that with the increasing cry for economy that the peak has been passed in the demand for highway culvert pipe, and that a diminishing demand was being experienced for sewer pipe, and that manufacturers would do well to make a study of the manufacture of irrigation pipe which would keep their plants in operation.

"Design of Mix for Thin Wall Structures" was the subject of an interesting paper by F. R. Zaugg. He called attention to three necessary elements, namely—curing, human element and materials—stating that none of these must be slighted in order to produce the perfect product. He advised the manufacturers to scrutinize the product for defects, especially in the 4-, 6- and 8-in. pipe, and showed by charts that at 3.72 is the best grading of aggregates in making watertight pipe and outlined the Tyler standard sieve and screen curve.

The seven committees which are all active in promoting the good work of the association held their various meetings and perfected their various organizations for the work during 1928.

At the second day session the members were treated to a most instructive talk by Clare Bullen of Chicago, who was warmly welcomed by a number of his former associates in the northwest field. He gave the members some interesting history of his pioneer efforts in their field in the introduction of concrete products, gave an appreciation for the good fellowship manifested and yet cautioned them to let no disturbing element creep in among themselves, and highly endorsed the proposed code of ethics.

He called the members' attention to the forthcoming convention of the American Concrete Pipe Association to be held January 24, 25 and 26 and urged that if possible they attend.

Mr. Bullen spoke highly of the good work accomplished by the Concrete Pipe Association all over the country and urged the members present to give them every assistance.

He called attention to the pleasant associations had with the Portland Cement Association and believed that without their support in the past and extensive advertising that products manufacturers would have had a much harder battle, and urged the members to give this association their hearty support at all times. He also urged the members that where possible to use cement manufactured in their own state.

Designing Good Mixes

Considerable interest was manifested in the water meter as demonstrated by Mr. Bullen, which he advised the members was one of the first manufactured by the Badger Meter Co. of Milwaukee. The machine is exact at all times and was recommended instead of the haphazard and uncertain methods now in use. Also by its use the work is speeded up and workmen can always be depended upon to turn out a good mix. The number of batches turned out are noted on a register and the producer no longer has to count the cement sacks.

Prof. S. H. Graf of the Oregon State College gave a brief talk on the results of the fellowship to date and introduced his star pupil, George Gleason, who gave a lengthy paper on concrete corrosion.

Percy Cupper, former Oregon state engineer, dwelt considerably on the time element in connection with concrete in highway use, and predicted that the products manufacturers are in the front line of progress in this nation. He believed also that ethics are today most essential and that the manufacture and sale of concrete products must be put on a high plane and then we would experience less trouble and woe. Successes in irrigation should be played up and less said about the failures, which had been harped upon by the clay interests.

He advised the members that there are 57 irrigation districts in Oregon, that 38 of these are constructive and doing good work, eight are in distress and the remainder undeveloped. He also urged the use of concrete to save our natural resources. He emphasized the statement that natural resources, however, never made a community, and that they must have the spirit of progress.

He concluded his remarks with the suggestion that if the association had not as yet coined a slogan, that he would suggest "Concrete Progress."

Experimental Work on Concrete Pipe

Professor Collier of the University of Washington opened the final session, outlining in part the experimental work done at the college. His paper was on "Waterproofing." He advised that the tests had been very thorough and illustrated his remarks with numerous diagrams showing water pressure used, 145 lb. pressure having been found most satisfactory and 73% the best water tightness in experiments so far conducted. He introduced two of his star students, W. T. Wright and R. P. Rodgers, who recently divided the prize of $200 offered by the Northwest Concrete Pipe Association and who intend to make further tests along waterproofing lines.

In the absence of C. H. Purcell, district engineer, U. S. Department of Agriculture, a paper was read by R. E. Merrick of the Department of Public Roads on the "Irresponsible Contractor." He advised that all bids should be properly prepared, that they were always advertised in two or more representative newspapers, and that contractors would be required to fill out a questionnaire, as his department wished to do business only with firms having an established reputation.

They believed in this way they were helping the bonding companies. He urged the manufacturers to investigate in every case the cause of failures. Roads in all directions in the states of Oregon, Washington and Montana are to be improved during the coming year and he predicted that business would be especially good in culvert pipe, and that new specifications for this class of pipe would soon be issued.

Smaller Concrete Units the Rule

A paper prepared by J. E. Jellick, Pacific Coast manager of the Portland Cement Association, was read by Charles B. Nims on "Recent Developments in the Cement Industry." Increasing use had been noted in the manufacture of smaller and lighter concrete products during the past ten years, especially the building tile, 5x8x12-in. size. He recommended that plants work two or three shifts a day and concentrate on the small concrete products instead of turning out only the large sizes and working but two to three days a week.

During 1928 the association has decided to make a more aggressive campaign to distribute its product, increase the quality and cut costs of production, to hold schools at various centers, issue advertising copy, encourage salesmen, put out house plans, and furnish tie-up to manufacturers, and urge them to stimulate their own sales force along their individual lines.

He predicted a busy year ahead, but urged the manufacturer of concrete products to create the demand, keep up prices and thus lower overhead, and to consult the cement association often and if any problems develop bring them to our attention.

Urge Use of American-Made Materials

During the closing minutes of the meeting, Messrs. Sharp, Bullen and Collins discussed the purchase of American-made cement, and comparisons were made with the foreign product. Although cheaper, Mr. Bullen urged his hearers to remember to buy the American product, as it was produced under better labor conditions, labor was given a fair wage, where it was exactly the reverse in foreign countries.

W. F. Paddock of Seattle gave a report from the culvert pipe committee and offered new specifications on the various sizes. This opened considerable discussion, especially on the reinforcing of the larger sizes; whether they should be single or double, and it is expected that this subject will be brought up again at the midsummer meeting.

Clyde Grutze, chairman of the general convention committee, made a motion that President W. H. Sharp be named as delegate to the New Orleans convention, and this was unanimously carried.

The following officers for the coming year were unanimously elected: W. H. Sharp, president; Hans Mumm, Jr., first vice president; Ned Ballinger, second vice president; G. E. Tucker, third vice president; H. A. Hall, treasurer, and F. R. Zaugg, secretary.

Carolina Concrete Pipe Co. Formed by Merger

A RECENT merger of cement products companies in North and South Carolina has just been announced. The new company will be known as the Carolina Concrete Pipe Co. and will maintain general offices at Charlotte, N. C. The plants will be at Charlotte and Lilesville, N. C., and Columbia, S. C., where the plant of the Standard Concrete Products Co. has joined in the merger.

The officers of the consolidated company are: F. J. Blythe of Charlotte, president; T. Keith Legare of Columbia, vice-president and sales manager; S. H. Clark of Lilesville, N. C., vice-president and general manager; and W. Sinclair Stewart of Charlotte, secretary-treasurer. Mr. Legare was formerly president of the Standard company. The Carolina Concrete Pipe Co. was incorporated in October, 1927, for $250,000.

American Concrete Institute to Meet in Philadelphia

THE 24th annual convention of the American Concrete Institute will be held on February 28 and 29 and March 1 at the Benjamin Franklin Hotel in Philadelphia. The announcement of the program points to some very interesting sessions, with papers presented by men very well known in their chosen lines of work.

The opening session of the Institute convention will be devoted to the discussion of workability of concrete. George Conahey and George A. Smith will present a joint paper on the measurement of workability in an effort to reach a precise understanding of its characteristics. P. H. Bates will discuss the influence of cement on workability. A. T. Goldbeck will present a paper on aggregates as a factor in workability; R. L. Bertin will discuss water as a factor in workability. Nelson L. Doe will consider workability from the viewpoint of the contractor as its affects problems of conveying and placing. R. W. Atwater will discuss workability from the engineer's standpoint.

At the evening session on February 28 W. E. Hart, manager of the Structural and Technical Bureau of the Portland Cement Association, will present an extensively illustrated paper on "Reinforced concrete walls for buildings." The basis for his discussion of the several interesting problems involved lies chiefly in a study of a considerable number of monolithic concrete structures in Pacific coast cities. P. H. Bates, of the U. S. Bureau of Standards, and Professor Alfred H. White, of the University of Michigan, will present papers on crazing.

"Predicting concrete strength with increased precision" will be presented by H. J. Gilkey of the University of Colorado, and T. D. Mylrea of Carnegie Institute of Technology will give a paper on "The carrying capacity of semi-circular hooks." C. A. Wiepking of the Department of Public Works, Milwaukee, Wis., will present a paper on testing concrete in the field.

Specifications for concrete stone will be discussed by several manufacturers before the Institute and probably in more detail in a meeting of the manufacturers by themselves. George J. Eyrick, Jr., of Smith, Hinchman & Grylls, architects and engineers, Detroit, will present a paper which will outline the view of the architects and engineers in reference to concrete building units, both the standard dimension concrete brick, block and tile, and the special dimensions of artificial stone. D. R. Collins will present a paper on what the Wisconsin building code has done for concrete building units in Wisconsin. Lightweight aggregate for building units will be discussed by A. Scherer of the Best Block Co. of Milwaukee. It is also noted that the American Concrete Institute specifications for concrete brick will be up for revision at the convention at this time. L. E. Grube, president of the Wisconsin Concrete Products Association, will present a brief paper telling of the experience of his company, the Sheboygan Brick Co., Sheboygan, Wis., in drying concrete brick to take out the shrinkage after initial curing.

A paper of considerable importance, and probably the longest ever presented to the Institute, is the one on "Design and cost data for the proposed 1928 American Concrete Institute standard building code." The new building regulations prepared by the committee on reinforced concrete building design and specifications will be presented by F. R. McMillan, director of research of the Portland Cement Association.

Papers on reinforced concrete slab design, skew arches, and "Better Concrete" will complete the program. The specifications for concrete pavements for highways will be considered for revision at this time also.

It is announced that the first of the Henry C. Turner medals will be awarded at the 1928 convention to Prof. Arthur N. Talbot of the University of Illinois "for outstanding contributions to the knowledge of reinforced concrete design and construction." The annual award of the Leonard C. Wason medal is to be made to Arthur R. Lord for his paper, "Notes on Concrete—Wacker Drive, Chicago," as the "most meritorious paper of the 1927 convention."

Ohio Products Association to Meet at Cincinnati

PLANS have been completed to hold the annual convention of the Ohio Concrete Products Association in Cincinnati, Ohio, February 14, 15 and 16, 1928, inclusive, at the Gibson Hotel. The convention will be open to all concrete products manufacturers and persons interested in the betterment of concrete products. The Cincinnati Concrete Products Association is sponsoring the convention and making all the arrangements. It is stated that there will be special entertainment for the visiting ladies.

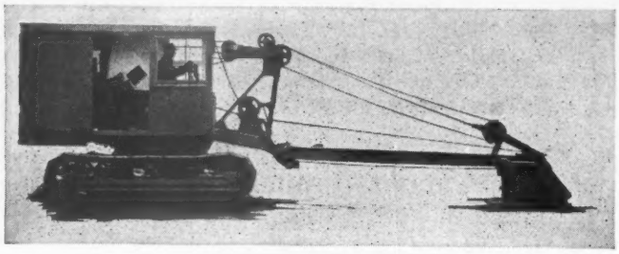
New Machinery and Equipment

New Pull-Shovel Skimmer Scoop

THE Northwest Engineering Co., Chicago, Ill., announces a new pull-shovel skimmer scoop confined to the Model 2 and Model 3 sizes. The design is said to simplify the convertibility from pull-shovel to skimmer, only six minor changes and reeeving of the cables being required to make the change from one type of machine to the other, according to the manufacturers.

All the features claimed for other Northwest shovels are said to be incorporated in the new machine.

The design is novel in that the same boom is used for both pull-shovel and skimmer. A shear leg hinged to the machine can be tilted forward or backward by the boom hoist. This is said to permit a micrometer adjustment of the boom and thus give, it is claimed, greater depth of cut with the pull-shovel and permit cutting with a flat boom the full length of the cut with the skimmer.



New pull-shovel skimmer scoop

The boom is a true box section consisting of ship channels welded top and bottom with heavy plates. The same dipper can be used for both machines, as it can be removed from the pull-shovel stick and attached to the carriage of the skimmer. The boom head design is said to permit running the dipper teeth beyond the boom point. The dipper is heavy and of the bottom-dump type.

New Light-Weight, High-Speed Diesel Engine

THE BUDA CO., Harvey, Ill., announces the Buda M.A.N. Diesel engine, representing, it is claimed, the latest development in light-weight, high-speed Diesel engines for shovels, cranes, compressors, pumps, locomotives, hoists, and many other pieces of equipment used in the rock products industries. The new engine is manufactured under license from the Maschinenfabrik Augsburg-Nurnberg A. G. of Germany, commonly known as the M.A.N. Co., in whose shops Dr. Rudolph C. Diesel built his first engine over 30 years ago.

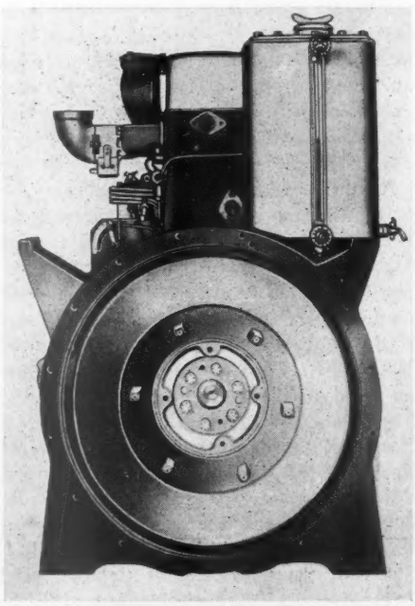
All the operating features of a heavy-duty gasoline engine are claimed for the new M.A.N. Diesel with the added advantages of low fuel cost. Space requirements are said to be about the same as for a gasoline engine of similar power.

Compressorless construction—that is, the system of injecting fuel into the cylinders without the aid of compressed air—is advanced by the manufacturers as one of the main reasons for the lightness of this engine. The omission of an air compressor is also said to simplify operation and servicing.

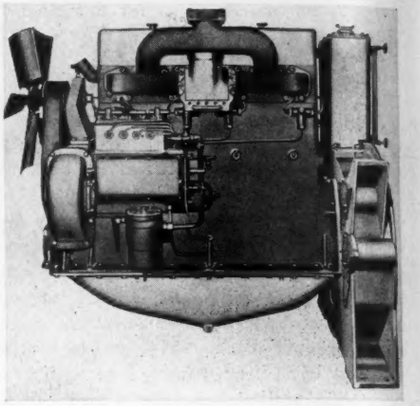
The Buda M.A.N. 6x8 high-speed Diesel engine is of the solid-injection, four-cylinder, four-stroke-cycle type, and rated to develop 92 b.h.p. at a normal speed of 1000 r.p.m., and is arranged for ledge or three-point mounting. Bell housing size, SAE No. 0 or 00. Fuel having a Baume gravity of approximately 26 to 38 can be used.

In the new engine the fuel is injected directly into the combustion chambers, and a constant volume of air is taken into each chamber with the intake stroke.

The fuel pumps are arranged to meter fuel in proportion to the speed and power required, and the pumps are connected with the governor so as to control the duration of fuel injection according to a specific crank angle proportionate to the speed and load. This produces about the same effect as the butterfly valve in a carburetor. The fuel pumps also are arranged so that injection can be advanced or retarded according to speed, a feature which is said to eliminate the high acceleration stresses and insure smooth and quiet operation.



End view of new Diesel engine showing the flywheel, drive connection and lubricating oil tank



New light-weight, high-speed Diesel engine

The lubrication system is the force-feed, dry-sump type, and includes pressure to the piston pins and to the rocker arms operating the overhead valves. A well-designed filter is incorporated in the oiling system.

Electric starting motors or a two-cylinder air-cooled gasoline engine can be supplied for starting duty. Both types of starters are equipped with Bendix drives. A compression release is incorporated in the engine to provide easy starting.

New Surfacing Metal

STOODITE, a new iron alloy for hard-surfacing drilling tools, shovel teeth and other equipment where a hard and abrasion-resisting material is desired, is announced by the Stoody Co., Whittier, Calif. The new alloy is claimed to be suitable for welding with any kind of iron and steel and the coating of Stoodite deposited said to cohere perfectly and possess remarkable hardness which it retains even at a red heat. Stoodite is claimed to be non-magnetic, resistant to nearly all acids and to corrosives such as sea water and to have practically the same thermal expansion as steel. The melting point of Stoodite is also said to be very close to that of mild steel. It may be applied to equipment either by the arc-welding process or the usual oxy-acetylene; no final grinding being necessary, it is claimed.

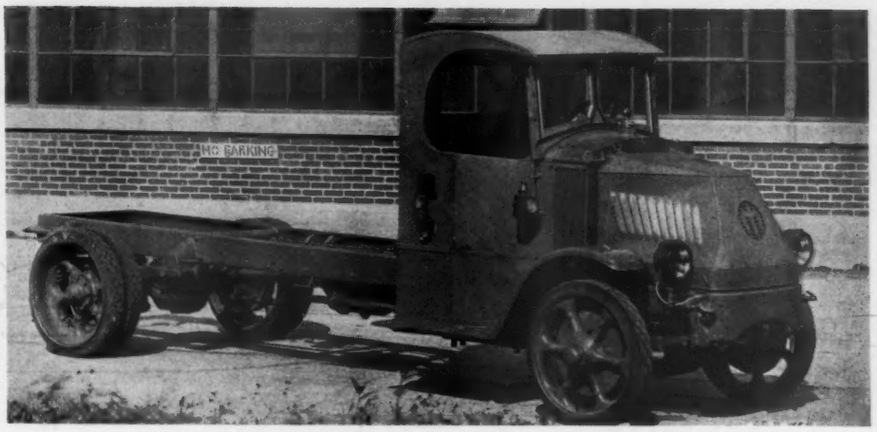
New High-Speed Heavy Duty Motor Truck

A NEW heavy duty truck, model AK, has been brought out by the Mack Trucks, Inc. The machine has a capacity of 3½ to 5 tons with 162-in., 174-in., and 186-in. standard wheel bases. Characteristic features of the older AC model have been incorporated in the new truck and in addition to the dual-reduction drive, the standard Model AC chain drive is also offered on the new Model AK. Some of the special features claimed for the new truck are:

Engine of 4⅝ in. bore and 6 in. stroke with cylinders cast en block with detachable aluminum heads. The transmission is suspended in four blocks of live rubber held under compression. An extra high speed reverse may be obtained at a slight extra cost. A cover opening at the side permits accessibility to the transmission without removing the floorboards. The springs are rubber shock insulated.

Four wheel brakes of the internal expanding type have been made standard on this model. The emergency brake operates mechanically and is of the external contracting type. On the chain drive model it is located on both jackshafts while on the dual reduction model it is mounted on the rear end of the transmission. The new Model AK is said to have a sharper turning circle than ever before offered on Mack trucks. This has been effected by center point steering.

A 40-gal. gasoline tank is mounted under the driver's seat with the filler opening through the right side of the cab. The cab itself is all steel with sliding doors and is mounted in rubber shock insulators. The seats are mounted in rubber.



New high-speed motor truck for quarry operations

Improved Cutting Blowpipe

A NEW CUTTING blowpipe, known as type C-14, which it is said will not backfire even under the most severe operating conditions, has been added to the line of the Oxweld Acetylene Co., New York.

This blowpipe uses the same nozzles as the Oxweld type C-2, which it resembles, although several improvements in design have been made. The three gas tubes are straight, having no bends either outside or inside the handle. The cutting valve is of the same design as has been used on the type C-6 for many years and is now used on all hand cutting blowpipes of the same make.

Some time ago the small needle valve bodies used for acetylene on the cutting blowpipes were improved by making them pressure forgings. Now, in addition to these, both the head and the rear body of the type C-14 are also pressure forgings instead of castings, giving better appearance, increased durability and lessened weight.

Interchangeable nozzles are provided so that the blowpipe may be used with either medium or low pressure acetylene. Obviously the medium pressure nozzle cannot be used with low pressure acetylene, but the low pressure nozzle can be used with a medium pressure acetylene supply if low pressure is maintained in the hose and blowpipe. To accomplish this the regulator should be adjusted to give a flame showing an excess acetylene cone not more than 1 in. long when the acetylene valve on the blowpipe is wide open. The acetylene valve should then be adjusted to obtain the neutral flame.

Improved design of cutting blowpipe

New Type of Magnetic Separator

A NEW TYPE of magnetic separator, especially designed to remove the iron content in pulverized slag, is announced by the Magnetic Manufacturing Co., Milwaukee, Wis. The "High Duty" separator has been installed at the Superior Portland Cement Co., Superior, Ohio, where it is said to be handling in an efficient manner about 40 tons per hour of the crushed slag which the company uses for cement manufacture. At the same time, the recovered iron content is said to be disposed of profitably.

The crushed slag is delivered to the separator by means of a drag flight conveyor. The feed is controlled by an adjustable positive feed hopper. Two independent stationary magnets arranged in staggered relation are mounted in a fixed position within the frame. Pressed steel cylinders of uniform size are mounted on substantial flange end members. These cylinders are made to revolve on ball bearings and are driven by hardened steel roller chain over machine cut steel sprockets. The magnets are designed

New magnetic separator installed at a slag crushing plant

to produce a maximum magnetic field at the working face of the cylinder, and further, to provide for automatic discharge of the iron removed.

The separator is driven by a fully enclosed d.c. motor. Direct current is also used to energize each magnet. Lead wires are protected by armored steel conduit. The frame is of substantial steel construction, firmly bolted and braced. A fully enclosed safety switch having ample resistance mounted therein to fully protect the magnet windings against breakdown together with motor control is attached to switch panel mounted on frame. A dust collector system has been installed and the magnetic separator has been fully enclosed.

Construction of New Texas Cement Mill to Start by July

A RECENT extension of time in the contract with the state of Texas gives the backers of the projected cement plant near Aransas Pass, Texas, until July 25, 1928, to start work on the new mill. Coy Burnett of San Diego, Calif., and I. C. Robertson of Los Angeles are the men back of the proposed plant, and they have obtained a contract from the state for the use of oyster shells from deposits owned by the state. The contract calls for a payment of a royalty of 4 cents per ton on the shells, with a minimum to be used of 100,000 tons annually. The new mill is to have a capacity of 1800 tons daily and is to be located on Harbor Island near Ingleside, Texas, so that it will have adequate deep water transportation facilities.

Utah Rock Asphalt Corporation Organized at Pueblo, Colo.

A NEW million-dollar enterprise in the rock products industry was recently launched when the Utah Rock Asphalt Corp. of Pueblo, Colo., was incorporated under the laws of Colorado. The corporation was organized by a group of Pueblo business men to take over and develop a deposit of rock asphalt located at Sunnyside, in Carbon county, Utah, near the Colorado line. The offices of the company will be in Pueblo, and the officers are C. M. Powers, president; John F. Cregan, vice-president; Ben Bergerman, secretary, and Herbert A. Black, treasurer. Mr. Cregan is also chief engineer for the new corporation. He is a mining engineer who was formerly research engineer for the Thomas A. Edison Co., and was also associated with the New Jersey Zinc Co., the American Metal Co. and the American Smelting and Refining Co.

The authorized capitalization of the company consists of 5000 shares of 8% preferred stock having a value of $50 per share, and 800,000 shares of common stock with a par value of $1 per share, making a total capitalization of $1,050,000, of which about half is said to have been subscribed. The financing has been practically completed. No common stock is to be offered to the public. Arrangements have been made in Chicago and New York for further financing if the development of the company should be so rapid as to necessitate a greater investment than is now contemplated.

The deposits which the Utah company is developing are in siliceous rock, thus differing from the limestone rock asphalt found in Kentucky. The company has acquired properties estimated to contain large deposits of rock asphalt overlaid with little overburden. The company's engineers estimate the minimum amount available to be about 500,000,000 tons, a supply sufficient to keep the quarries in continuous operation for a long time.

Equipment will be installed as soon as possible and production for the market will begin in April. The company has already secured, it is said, contracts sufficient to keep the quarry in steady operation during the coming year. The first carload which will be produced from the property has already been sold to the city of Pueblo and will be used upon the streets of Pueblo.—*Pueblo* (Colo.) *Chieftain.*

Marble Cliff Quarries to Establish Asphalt Plant

ACCORDING to recent reports, the Marble Cliff Quarries Co. of Columbus, Ohio, is contemplating the establishment of a plant for the manufacture of rock asphalt at Bellaire, Ohio. An option on a suitable site is said to have already been obtained in that city, and it is expected that the Marble Cliff company will go ahead with the proposition in a short time. The growth of the asphalt paving industry is given as the reason for the establishment of the plant at this time.—*Bellaire* (Ohio) *Leader.*

Dolomite Products Co. to Move Whole Town

ACCORDING to recent reports, things are moving right along at the big quarry of the Dolomite Products Co. near Tiffin, Ohio. The next thing to be moved, it seems, is a whole town. The little village of Narlo is directly in the path of the development of the quarry, and the company is planning the removal of the buildings to a more distant and less needed point. Many of the houses will be moved to the town of Bettsville, nearby.—*Toledo* (Ohio) *Blade.*

New Gravel Company Planned for Florida

ACCORDING to an *Associated Press* dispatch, plans have been completed by Charles A. McKeand of Tampa, Fla., for the removal of millions of tons of sand and gravel from the Apalachicola river in Florida for use in construction work in that state. Actual operations are to be carried out on the Apalachicola river by permit from the trustees of the internal improvement fund, it was stated. Mr. McKeand will head a company which will operate over 40 miles or more within the state's limits, the estimated gravel to be produced to be about 10,000,000 tons and the sand in unestimated millions of tons.

Arrangements have been made with the Seaboard Air Line railroad to construct a spur to the operating location, it was stated. The report of the State Department of Agriculture says that the gravel at this point is of a good grade.

Cement Association Adds Features to Its Safety Campaign

IN RECOGNITION of the splendid service being performed by workmen in the cement mills and quarries in connection with recent successful safety campaigns, the committee on accident prevention and insurance of the Portland Cement Association has just authorized the issuance of an attractive honor card and button which will be made available early in 1928, for distribution to men who have completed the year's work without accident to themselves or others.

While a number of cement companies already issue their own cards of this sort or provide other recognition of some kind for safe workers, it is understood that the new card and button will be quite generally adopted. In addition to a certificate form attesting to the safe record of the worker whose name appears on the card, the legend, "There is no substitute for a careful man," appears to stress the dependence which the industry places on the individual man for the success of its safety efforts.

According to present expectation, the plan, if successful, will be explained next year to provide further recognition for those who work two years safely. It is also contemplated that workmen who complete five years of safe work will be designated to secure special distinction as honorary life members of the mill safety committees with unusual privileges.

New Conditions for Award of Safety Trophy

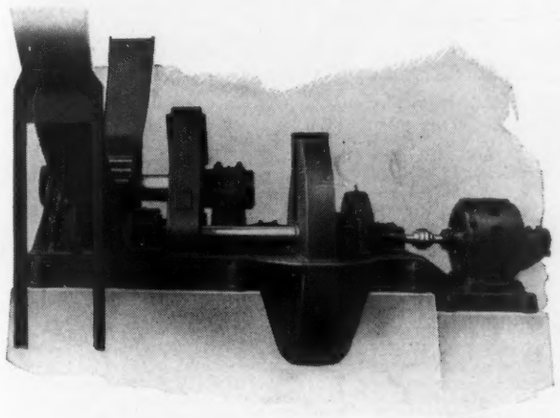
It is now definitely known that the association's safety trophy contest will be continued in 1928 under conditions which lead association officials to contemplate a general enrollment of the 160 mills represented in association membership. In addition, a certificate of merit in safety work is being provided for award to any plant which succeeds in working any 365 consecutive days without lost time or fatal accident. Several cement mills which have failed to win the trophy succeed each year in completing 365 days without mishap. In the past these mills have received no recognition because their records did not happen to coincide with the calendar year.

Recognition for Those Who Save Life

A special board of award was recently authorized by the Portland Cement Association to receive evidence of acts by employes resulting in the saving of life. This board, which will be designated shortly by Chairman J. B. John of the committee on accident prevention and insurance, will make recommendations for suitable recognition in such cases. This will be recognized as another indication of the desire throughout the industry to bestow reward and honor on competent and careful men and thereby outlaw carelessness.

Development Based on Experience

YEARS of experience has placed Allis-Chalmers in the forefront of present day engineering practice and machinery design. Recent developments and improvements have been consistent with this age long policy. In the design of driving and carrying mechanism for kilns, dryers and coolers, the subject of simplicity and elimination of friction has received the most careful consideration, all of which is expressed in the operating economy of Allis-Chalmers products.

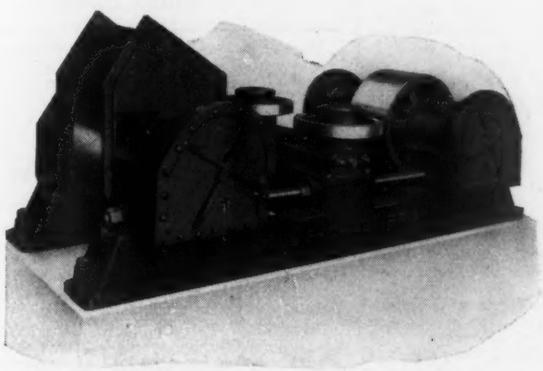


Direct Connected Driving Mechanism for rotary kilns, coolers and dryers

Developments of great importance have been made to our kiln and cooler equipment. The driving mechanisms are so designed as to give the proper reduction for direct connection to the motor. All of the gears are totally enclosed, the high speed gears having a cast iron housing which is oil tight and dust proof.

The cut to the right shows a recent development in large anti-friction bearings used in connection with compeb mills with bearing bases having rollers to take the longitudinal expansion of the mill.

Large Anti-Friction Bearing with Roller Expansion Base



New Tension Rod Type Self Oiling Carrying Mechanism for rotary kilns, coolers and dryers

The carrying mechanisms are equipped with a new type of oil wheels which insure automatic and continuous lubrication of the bearings, the oil being circulated out of the large reservoir in the base of the bearing. Bearings are also arranged for water cooling if desired. Tension rod type construction is used for these carrying mechanisms.

Write for Our Bulletins

ALLIS-CHALMERS

MILWAUKEE, WIS. U. S. A.

News of All the Industry

Incorporations

Canada Fluorspar Co., Ltd., Toronto, Canada, $40,000.

Hoosac Valley Lime Co., Adams, Mass., increasing capital stock from $50,000 to $100,000.

Bainbridge Quarry Co., Cape Girardeau, Mo., $10,000. Logan E. Bean, S. D. True and Louis Mayer.

Lind Gravel Co., Bellingham, Wash., $100,000. James G. Benton, Ida C. Benton and Russell E. Lind.

Maribel Gravel Co., Denmark, Wis., 500 shares of $100 each. W. W. Bruss, H. A. Bruss and Fred Hansen.

Rock Products Corp., Ft. Worth, Tex., $15,000. A. P. Heddix, S. V. Evans and Austin F. Anderson.

Contractors Rock Asphalt Co., Birmingham, Ala., $275,000. John Wills, 913 S. 40th St., Birmingham, secretary.

Michigan Concrete Co., Highland Park, Mich., $75,000 and 25,000 shares, no par value. To manufacture cement products.

Rice Sand and Gravel Co., St. Louis Park, Minn., $50,000. Carl J. Rice, 3136 Second Ave. S., Minneapolis, Minn., and others.

Ace Cast Stone Co., New York, N. Y., 500 shares common stock. Attorney, T. E. Shea, 217 Broadway, New York.

Arkadelphia Gravel Co., Arkadelphia, Ark., $10,000. T. G. Clark and E. W. Huie, Jr., of Arkadelphia, and J. B. Mason of El Dorado, Ark.

Granite Gravel Co., Ltd., Midland, Ont., $500,000. Frederick Schaeffer, Detroit, Mich.; J. S. McCormick, Windsor, Ont., and others.

Chillicothe Sand and Gravel Co., Chillicothe, Ohio, 500 shares, no par value, and $50,000 preferred stock. George W. Quillin, H. H. Davis and E. M. Marquand.

Otis Construction Co., Chicago, Ill., $50,000. To quarry stone and dig sand, gravel and clay; to manufacture and deal in stone lime, cement, brick, gravel, etc. T. J. Murray, M. A. Flanagan and W. P. Cagney.

Cinder Concrete Units Corp., Boston, Mass., $200,000; 2000 shares preferred stock at $100 each and 4000 shares common stock, no par value. Stephen Kearney, 142 Third St., Lowell, Mass., and Evvie F. Dalby.

Magnesite Sales Corp., Spokane, Wash., $10,000. To produce and distribute magnesite products, including stucco, and coloring for concrete products. Distribution at Spokane will be in conjunction with the Spokane Concrete Pipe Co.; at Chicago, through the Illinois Concrete Sales Co., and on the Pacific coast, through the Concrete Pipe Co. of Portland, Ore. Chris Spies, Portland, Ore., president; W. J. Mabon, Spokane, vice-president; Carl Warren, Spokane, secretary and treasurer.

Sand and Gravel

Coast Rock and Gravel Co., San Francisco, Calif., has leased offices in the new Hunter-Dulin Bldg. in San Francisco.

Packer Gravel Co., Fairbury, Neb., organized by James Packer, Harold Packer and C. E. With, is opening a gravel plant north of Fairbury.

Moraine Sand Co., Dayton, Ohio, will supply the city of Dayton with 9000 tons of sand for asphalt paving work during 1928, according to a report in the Dayton Herald.

Columbia Sand and Gravel Co., Washington, D. C., is planning the erection of a new storage and distributing addition with a capacity of 5000 tons.

Bowsman Washed Sand and Gravel Co., Piqua, Ohio, is erecting a new $14,000 washing plant at Troy, Ohio, which is to be ready for operation early in the spring.

I. M. Gier, Kelso, Wash., has made application to the United States War Department for permission to dredge sand and gravel from the bed of the Cowlitz river a short distance from the Kelso city limits.

Colorado Valley Sand and Gravel Co., Smithville, Tex., has sold its gravel plant on the Colorado river near Smithville to House & Clark. The purchasers plan to install considerable new equipment in order that the output may be increased.

Pioneer Sand and Gravel Co., Seattle, Wash., has uncovered the bones of a mastodon, estimated to be 35,000 years old, in its pit at Fauntleroy, Wash. Professor Kincaid, of the University of Washington, found much of interest in studying the bones.

Quarries

Independent Gravel Co., Joplin, Mo., is erecting a new limestone crushing plant at quarries at Hannibal, Mo.

Boston Trap Rock Co., Boston, Mass., has gone into bankruptcy, listing total assets as $12,823 and liabilities as $285,800.

F. Hartung & Son, Wauwatosa, Wis., are reported to be building an addition to their crushing plant near Lisbon, Wis., including an Allis-Chalmers crusher.

Bartonville Rock Stone, Ltd., Hamilton, Ont., is opening a quarry at Bancrost, Ont., and erecting a large plant at Bartonville, Ont. The company produces a stone mixture for building purposes.

Willapa Pulp and Paper Co., South Bend, Wash., has acquired the Bear river limestone quarries as a part of its program for the construction of a new plant. The paper company made the purchase to insure a uniform supply of this necessary material for operation when the plant starts operating next August. The property includes 360 acres of land besides the quarry.

Cement

Buffalo Cement Co., Ltd., Buffalo, N. Y., is planning to rebuild the portion of its crushing plant which was destroyed by fire on January 10.

Volunteer Portland Cement Co., Knoxville, Tenn., is disposing of a bond issue of $600,000, a portion of the proceeds of which is to be used for expansion.

Portland Cement Association, Chicago, Employes of the southeastern offices of the association held their annual convention at the Biltmore Hotel in Atlanta, Ga., on January 23, 24 and 25.

California Portland Cement Co., Los Angeles, Calif., has authorized the expenditure of $500,000 for improvements to its plant at Colton, Calif., to include the installation of new kilns, according to reports.

Monolith Portland Cement Co., Los Angeles, Calif. Officials of the company gave a dinner for 400 employes of the Monolith, Calif., plant of the company recently. It is planned to make the dinner an annual affair.

Louisiana Portland Cement Co., New Orleans, La. Scott Thompson, newly elected vice-president and manager of the company, took office on January 16. Lewis R. Ferguson, formerly vice-president and manager, has been appointed assistant to the president of the International Cement Corp. of New York, of which the Louisiana company is a subsidiary.

Cement Products

Raymond Concrete Pile Co., Detroit, Mich., has taken offices in the new Hunter-Dulin Bldg. in San Francisco, Calif.

Lewis County Concrete Products Co., Centralia, Wash., has started work on its new plant at Chehalis, Wash.

Astoria Concrete Products Co., Astoria, Ore., is installing additional equipment for the construction of concrete pipe at its plant.

Feltstone Co., Inc., Portland, Ore., has moved to its new building at East Second and Salmon Sts., which it will utilize as office, plant and warehouse.

Ideal Cement Stone Co., Omaha, Neb. Charles Peterson has been elected president to succeed his brother, the late N. J. Peterson.

E. C. Topel, Libertyville, Ill., has leased a factory in Libertyville and will install a modern cement products plant there.

American Concrete Pipe Association will hold its annual convention in New Orleans, La., on January 24, 25 and 26.

Laura Gravel and Stone Co., Potsdam, Ohio, is contemplating the construction of a factory for the manufacture of cement drain tile, brick and cement blocks. E. C. Mattis is president of the company.

Ready Mixed Concrete Co., Pittsburgh, Penn., has awarded general contract to Hughes-Foulkrod Co. of Pittsburgh for a new four-story plant to cost close to $50,000 with equipment.

Atlantic Cement Products Co., Hicksville, Long Island, N. Y., has begun erection of a new plant, to cost about $200,000 with conveying, hoisting, loading and other machinery.

New England Concrete Pipe Corp., Boston, Mass., is planning a power house at its plant at Newton, Mass., to cost about $70,000 including the equipment. The building will be 150x160 ft. J. H. Rogers of Boston is the architect.

Hutchinson Concrete Co., Hutchinson, Kans., has recently been organized and has acquired a building for the manufacture of concrete products, including silo and storage bin units. Mr. Currier is president of the company and W. E. Rostine is secretary.

Wheeling Dun-Tile Brick Co., Wheeling, W. Va., organized by J. J. Allen and Frank Hallam, has leased an acre and a half of land from the city of Wheeling, on which they are planning to start a factory for the manufacture of tile and brick. The property is improved with several buildings formerly used as city shops.

Lime

Lively Lime Co., Gold Hill, Ore., is contemplating doubling the capacity of its plant during 1928. The company has resumed operations following a temporary closing for winter repairs. During the shutdown the plant continued to ship lime to the paper mills in the Willamette Valley from its reserve supply.

Silica Sand

Pittsburgh Plate Glass Co., Pittsburgh, Penn., has commenced the construction of a new sand dryer at works No. 4 of the company, at Ford City, Penn. The capacity will be several hundred tons.

Miscellaneous Rock Products

Kyrock Asphalt Co., Kyrock, Ky., has opened a new quarry at Sweeden, two miles from its old mines, and has added two 21-ton locomotives and 15 flat cars to its previous equipment. It is expected that the new equipment will add 250,000 tons to the yearly production.

Blue Ridge Talc Co., Inc., Henry, Va. Use of air mail considerably speeds industry, as was shown when an order for a carload of soapstone was received by the Blue Ridge company from the Pacific Graphite Co., Oakland, Calif. The shipment left the talc company's plant just 82 hours after the order had been mailed in Oakland, a saving in time of at least three full days.

Utah Rock Asphalt Corp., Pueblo, Colo. In the January 7 issue of ROCK PRODUCTS, under Miscellaneous Rock Products, it was stated that the Rubber-Rock Corp. of Price, Utah, was installing new equipment. This should have been the Utah Rock Asphalt Corp., as "Rubber Rock" is merely the trade name for the product of the Utah corporation. Elsewhere in this issue there is a full account of the organization of this company.

Personals

Roger Norris, who has been connected with the United States Gypsum Co. at Chicago, has been made manager of the company's new office at Reading, Penn.

Does a big trade-in allowance make the best buy?

Naturally you want full value for your present crane or shovel if you are going to trade it in on a new machine. But don't let the deal you make depend entirely on the amount of allowance. There are other factors to be considered.

1 First of all, you want *full value* in the new machine, and that value is determined by the service that the machine will give you.

2 Your present crane or shovel seemingly has different values. That is because competitive manufacturers or dealers are bidding to sell you a new machine.

3 There is only one basis on which your present crane or shovel can be evaluated, and that is the price it will bring in the used crane market.

4 The largest allowance you are offered does not necessarily make the best deal for you. It might, and it might not.

5 If you are offered a very large allowance it may mean that you will have to pay an excessive price for the new machine in comparison with its real value.

6 Remember *you are making a purchase*—not a sale. You are only getting a credit for your present crane against the purchase price of a new machine.

7 The difference in allowance you are offered may be more than offset by the additional service obtained, and really make the best buy for you.

ORTON FEATURES

Well-balanced design, sturdy construction and unexcelled workmanship.

Proper choice of materials and liberal factors of safety give dependability and long service.

Flexible (spring type) crawling tread overcomes obstructions. Steering is done with a differential, insuring extreme mobility.

Wide base gives stability and is a prevention against overturning.

Fast, full-revolving swing and perfect balance of the superstructure.

Simple and compact driving mechanism.

Separate clutch shaft for every operation—traveling, steering, hoisting, crowding, swinging, booming. Each operation can be performed singly or all together.

Easy and smooth operation; hoisting and swinging controlled by power applied clutches.

All parts readily accessible.

Abundance of power for every operation produced by the most efficient gasoline engines or electric motors.

Roomy, all-steel cab with operator's position well up in front, giving a clear view of the work.

ORTON CRANE & SHOVEL CO.
608 S. Dearborn St., Chicago, Ill.
Representatives in Principal Cities

ORTON
Cranes, Shovels & Buckets

Ralph Collins has been appointed sales representative in North and South Carolina and southern Virginia for the George D. Whitcomb Co. of Rochelle, Ill. His headquarters will be at Charlotte, N. C.

E. M. Norris, of the Anaconda Copper Mining Co., Butte, Mont., has been made general manager of the company's phosphate properties at Conda, Idaho. Edward Neyman, formerly in charge of the Idaho phosphate properties, has been transferred to the companies zinc properties in Poland.

Jack Edwards, general manager of the McGrath Sand and Gravel Co. of Pekin, Ill., has resigned from that position but has not announced what his plans are for the future. Robert Ashley, formerly assistant manager, has been promoted to the position of general manager.

George A. Olson, agricultural director of the Gypsum Industries, Chicago, Ill., has resigned, the resignation taking effect February 1, 1928. Previous to coming to Chicago, Mr. Olson was in charge of chemistry at the Washington Agricultural Experiment Station and was also chemist for the state of Washington.

John R. Newell, vice-president and manager of the Spokane Concrete Pipe Co. since its organization nine years ago, has gone to Chicago for a two-year period to be associated with the Illinois Concrete Sales Co. He also will handle the eastern business of the Magnesite Sales Co., a Spokane concern newly organized to market the output of the Spokane Plastic Magnesite Co. Carl B. Warren, who has been assistant manager of the Spokane Concrete Pipe Co. for some years, will have charge of the plant in Mr. Newell's absence.

Obituaries

Nathaniel W. Davis, retired sand and gravel dealer of Urbana, Ill., died on January 19 at his home from complications following a stroke of paralysis. Mr. Davis was 76 years old.

Thomas A. Jones, vice-president of the W. A. Jones Foundry and Machine Co., Chicago, died at his home in River Forest, Ill., near Chicago, on January 19. Mr. Jones had become associated with the Jones company in 1892 and for many years served as secretary. Later he became president of the company. In 1918 he took over the management of the Sachett Screen and Chute Co., Chicago, serving as president and general manager. He was 64 years old.

Manufacturers

Alloy Steel and Metals Co., Los Angeles, Calif., has appointed the Clyde Equipment Co. of Portland, Ore., as agents.

Climax Engineering Co., Clinton, Iowa announces the appointment of the Equitable Equipment Co., New Orleans, La., as sales agents for lower Louisiana and Mississippi.

Robert A. Bryce, mining engineer of Toronto, Canada, has announced the removal of his office from the Northern Ontario Bldg. to 1004-5 Atlas Bldg., Toronto.

Mundy Sales Corp., New York City, announces the following new agents: Herman M. Brown Co., Des Moines, Iowa; G. F. Lowe Co., Chicago; Star Machinery Co., Seattle, Wash., and George Mueller Equipment Co., Milwaukee, Wis.

Botfield Refractories Co., Philadelphia, Penn., manufacturers of refractory cement, announce the appointment of Ives Prosser as southeastern representative with headquarters in Atlanta, Ga. His territory will cover the south from North Carolina to San Antonio, Tex.

George D. Whitcomb Co., Rochelle, Ill., announce the development of an equalizing device for their locomotives which, it is claimed, distributes the load equally to both front springs, thus maintaining the rail-load at constant balance and increasing the flexibility of the locomotive.

Davenport Locomotive and Machine Corp., Davenport, Iowa, announce that Charles Pache, formerly secretary and treasurer of the company, has been elected president to succeed E. Parmly, Jr., who has severed his connection with the company. Mr. Pache, who joined the Davenport company in 1901, will also continue as treasurer.

Timken Roller Bearing Co., Canton, Ohio, announce plans for the expenditure of $4,000,000 for increasing the production facilities of the company during 1928. The greater part of this expansion will be at the plant at Canton, where both the steel mill and the bearing manufacturing plant are to be enlarged.

B. F. Goodrich Rubber Co., Akron, Ohio, has placed James D. Tew, first vice-president, in charge of all sales divisions of the company as general sales manager. Mr. Tew joined the Goodrich company in 1906 and was made superintendent of the tire division in 1918. He became works manager in 1926 and vice-president in 1927.

Nugent Steel Castings Co., Chicago, announce the election of George L. Pollock as vice-president of the company. Mr. Pollock was previously vice-president and treasurer of the Burnside Steel Foundry Co. and also served as purchasing agent for the Wheeling & Lake Erie R. R., the Chicago & Western Indiana R. R., and the Belt Railway of Chicago.

W. A. Jones Foundry and Machine Co., Chicago, made a number of changes in officers at its recent annual meeting. Warren G. Jones continues as president and general manager; George W. Page, who has been with the company for nearly 30 years, was made vice-president, and William F. Colman was elected treasurer and also general superintendent.

Blaw-Knox Co., Pittsburgh, Penn., has absorbed the Andrews-Bradshaw Co. of Pittsburgh and the latter will henceforth operate as the Andrews-Bradshaw Division of the Blaw-Knox Co. The Andrews-Bradshaw Co. manufacture devices for cleaning air and steam, used in boiler plants and similar installations. No change in the organization is contemplated except that the Andrews-Bradshaw products will now be manufactured in the main plant of the Blaw-Knox Co.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Heavy Duty Screens. Illustrated booklet showing views and detail drawings of Rotex screens. ORVILLE SIMPSON CO., Cincinnati, Ohio.

Ladders and Scaffolding. Bulletin No. 110, illustrated, of stepladder and scaffold equipment. PATENT SCAFFOLDING CO., Chicago, Ill.

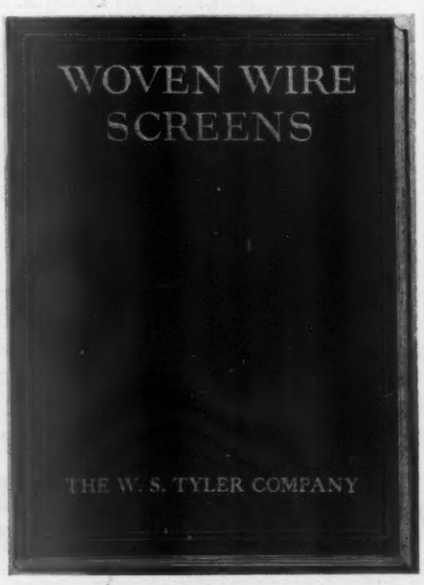
Nickel Alloy Steel Products. A buyers' guide of manufacturers of nickel steel alloy products for the use of purchasers of such products. INTERNATIONAL NICKEL CO., New York, N. Y.

Steel Plate Blower. Illustrated Bulletin No. 3504, with detail views and drawings and table of specifications of various types. AMERICAN BLOWER CORP., Detroit, Mich.

Paper Bates. Illustrated bulletin showing tests of paper bags used for cement and plaster, and views of bags in use on the job in wet weather. BATES VALVE BAG CORP., Chicago.

Shovel-Cranes. Illustrated bulletin showing the American Gopher in use as a shovel, crane, dragline and clamshell. AMERICAN HOIST AND DERRICK CO., St. Paul, Minn.

Woven Wire Screens. Illustrated catalog No. 55. A comprehensive book of 140 pages bound in flexible covers, illustrating types and uses of screen cloth, including installations of Hum-mer screens. W. S. TYLER CO., Cleveland, Ohio.



New 140-page book on screen cloth

Electric Hoists. Illustrated catalog No. 4-A, showing various types of hoists and pictures of hoists at work on large construction jobs in various parts of the world. MUNDY SALES CORP., New York City.

Truck and Trailer Cranes. Bulletin 639X, illustrated with views of cranes at work, and also detail views. **P. & H. Ground Hog.** Bulletin GH-2 showing the ground hog used as shovel, dragline, clamshell crane, skimmer scoop and trench hoe. **Excavator Cranes.** Illustrated Bulletin 650X, showing model 206B at work, and detail views of same. HARNISCHFEGER CORP., Milwaukee, Wis.

G. E. Bulletins. GEA-61A. Constant-speed direct-current motors. **GEA-63A.** Type GTE motors for gearless traction elevators. **GEA-529A.** Low-speed synchronous motors. **GEA-545B.** Automatic supervisory equipment, selector types. **GEA-570A.** Hand-starting compensators. **GEA-732A.** Oil fuse cut-outs. **GEA-823.** Atomic hydrogen arc welding equipment. **GEA-841.** Magnetic switch, across-the-line starter for induction motors. **GEA-858.** Low-speed direct-current generators. **GEA-875A.** Arc welder. **GEA-880.** Protective panels.

Speed Up With Air. Booklet illustrated with views of air compressors at work in varied and difficult jobs. **Drill Sharpening.** Illustrated bulletin showing use of drill sharpening equipment. **Belt-Driven, Single-Stage Air Compressors.** Illustrated Bulletin No. 83-I, showing details and views of installations of air compressors. **Portable Drill Steel Furnace.** Illustrated Bulletin No. 74-C, of portable furnaces for use with light work. **Rock Drills.** Illustrated Bulletin No. 81-S, describing use of "Rotator" rock drills. **Electric Portable Hoists.** Illustrated Bulletin No. 76-G, showing installations and uses of portable hoists. **Vertical Air Compressors.** Illustrated Bulletin No. 83-H, describing features of direct-motor-driven vertical air compressors. SULLIVAN MACHINERY CO., Chicago.

Non-Metallic Section of Institute of Mining Engineers to Meet

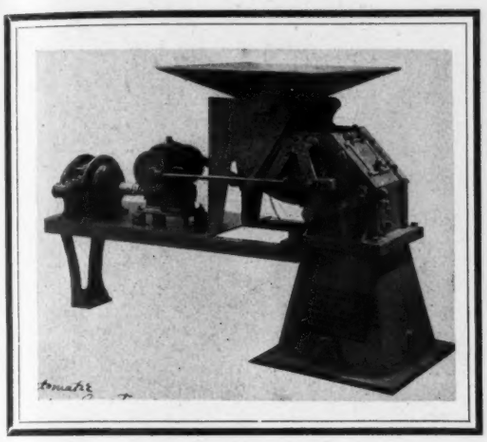
THE non-metallic session of the American Institute of Mining and Metallurgical Engineers will meet on February 20, during the general session of the Institute in New York City. A paper on St. Peter sandstone in Arkansas will be presented by D. D. Dunkin, and G. H. Laughlin will present a paper on "The Value of Petrology in the Quarrying and Use of Stone." Another paper, by J. R. Thoenen, on "Notes on Grecian Magnesite" should be of interest, as will the other papers to be read. The general sessions will be held at the Engineering Societies Bldg. and there will be a special luncheon for the non-metallic section at the Engineers Club on February 20.

Stewart Sand Co. Issues Annual Number of Its Bulletin

THE Stewart Sand Co. of Kansas City, Mo., has recently issued their 1927 review number of the magazine, *Better Building*, which the company gets out. This number contains something more than 60 pages, and is well illustrated throughout. There are a number of articles dealing with the technical side of buying and using materials, of particular note being such articles as "How Much Sand in Your Concrete?" "The Right Sand for Every Job" and "Points to Consider When You Buy Sand." A major portion of the book is taken up with illustrations of homes and public buildings in which materials of the company were used. The Stewart company is to be congratulated on the appearance and makeup of this effective advertising medium.

More and Better Lime—

Per unit of fuel burned



THE application of the "Ward" Automatic Coal Feeding System on Vertical Kilns has had the effect of increasing kiln capacity from 3 to 4 tons in a 24 hour period. Also, by maintaining an even temperature in the kiln at all times, a better and more uniform quality of lime is produced. In brief, "Ward" Automatic Coal Feeders will

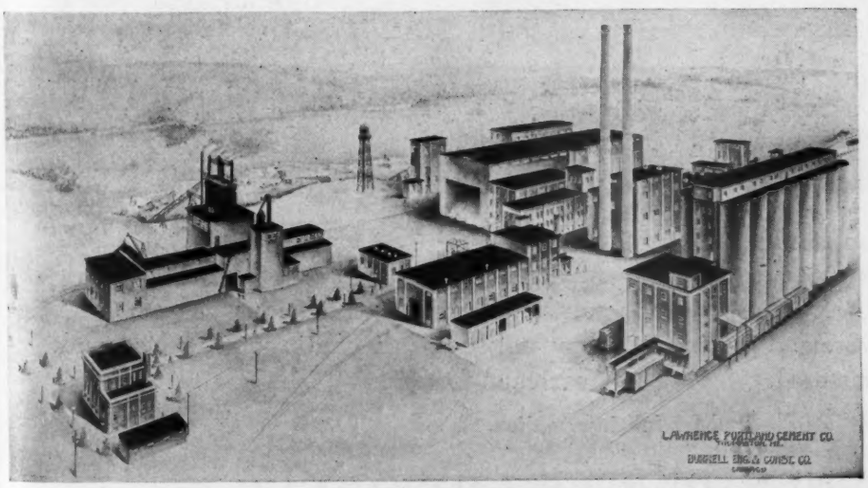
INCREASE TONNAGE
IMPROVE QUALITY OF LIME
IMPROVE FUEL RATIO
CUT LABOR COSTS
PRESERVE THE BRICKWORK IN FURNACE AND CALCINING CHAMBER

Write for new catalog covering all phases of our Centralized Control Lime Plant Service

ARNOLD & WEIGEL
WOODVILLE, OHIO, U.S.A.

BURRELL ENGINEERING and CONSTRUCTION COMPANY

513 JACKSON BLVD., CHICAGO



Designers and Builders of

Cement Plants, Stone Crushing Plants, Lime and Gypsum Plants, and Associated Buildings

Our artist's conception of the plant under construction for Lawrence Portland Cement Company, Thomaston, Maine, noteworthy because plant is practically concrete throughout

A PARTIAL LIST OF OUR CLIENTS

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Blue Mountain Stone Co.
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Indiana Portland Cement Co.
International Cement Co.
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Lehigh Portland Cement Co.
Louisville Portland Cement Co.
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Michigan Alkali Co.
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Tomkins Cove Stone Co.
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Volunteer Portland Cement Co.
Wellston Iron Furnace Co.

. . . . . The Speed and Endurance for which Gardner-Denver Rock Drills are known throughout the world, are possible only through the extreme care and precision with which they are manufactured.

. . . . . Fast, long-lived, easily handled, delivering powerful blows, they hit the mark under all drilling conditions and combine low upkeep with continuous service and maximum footage.

Send for full information.

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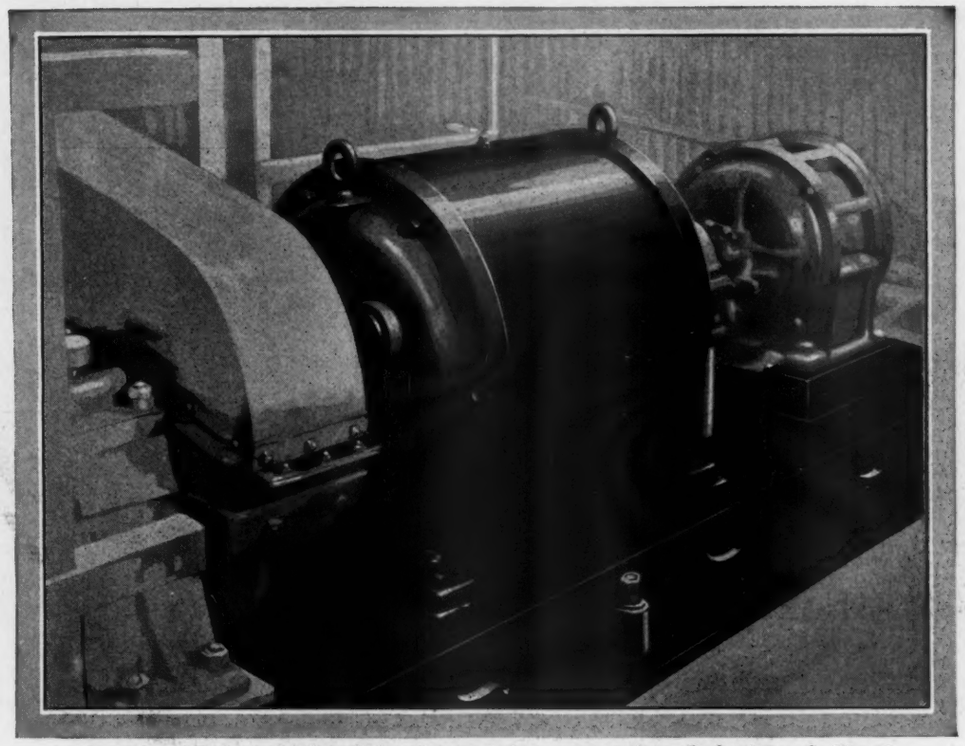


Jones Speed Reducer driving clinker elevator in large cement plant. Reduction ratio 27 to 1.

Speed Reduction Drives
IN CEMENT MILLS

Perhaps no one industry has extended greater recognition to Jones Speed Reducers than has the cement industry.

The above illustration shows one of many Jones reducers used by one large company. Their experience, based on operating records, proves the outstanding superiority of Jones Spur Gear Speed Reducers in actual operation.

Such is the conviction, too, of other cement manufacturers and, as a consequence, Jones Spur Reducers are in high favor with cement mill engineers.

The balanced straight line drive from the motor to the driven machine; the dust-proof housing; the constant and positive lubrication; fewer parts; the saving of space; minimum upkeep expense—no attention required other than occasional replenishment of the oil supply; insurance of correct alignment with motor and reducer on same cast-iron base, these are some of the features that make Jones Speed Reducers so dependable in performance and so economical in cost.

If you have a speed reduction problem, perhaps our engineers can be helpful. Write direct to the home office or the branch sales and engineering office near you.

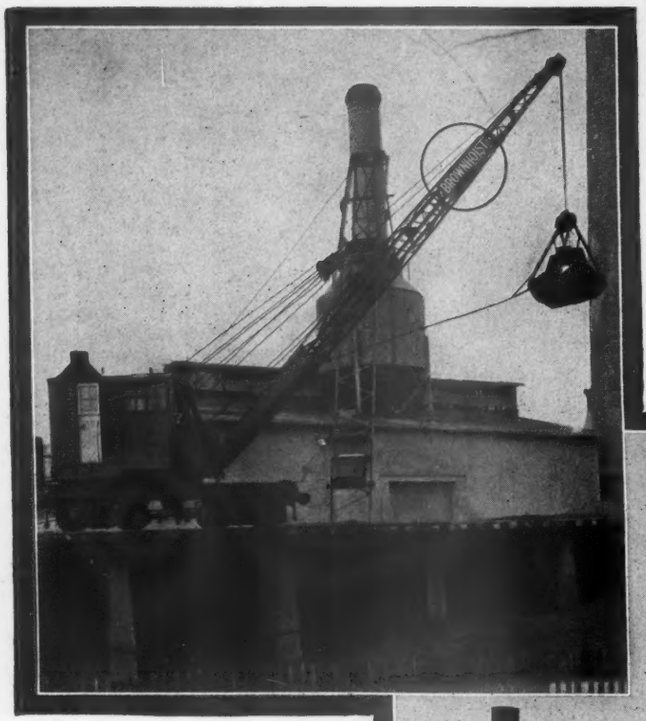
W. A. JONES FOUNDRY & MACHINE COMPANY

Main Offices and Works: 4422 West Roosevelt Road, Chicago, Illinois

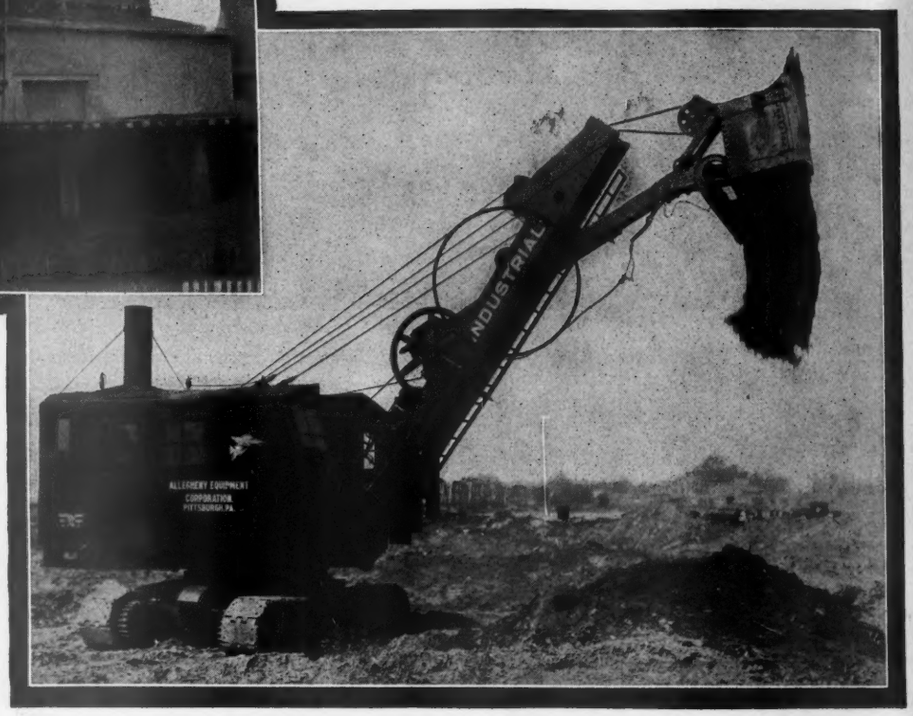
Branch Sales and Engineering Offices:

New York Cleveland Milwaukee Pittsburgh Buffalo Detroit
Birmingham St. Louis Cincinnati Peoria Los Angeles San Francisco

Jones Speed Reducers



Dependable Trade-Marks for 50 Years



Above—Twenty-ton capacity steam locomotive crane.

At Right—Fifteen-ton capacity steam shovel crane. Also furnished with gas engine or electric power.

No company can offer you the wide choice of cranes for your work and none has had the long and valuable experience of Industrial Brownhoist in the economical handling of materials with crane equipment.

Industrial Brownhoist builds many different types of locomotive and wrecking cranes that range in capacity from 7½ to 200 tons. We also build crawler cranes and shovels, all of which types have proved their dependability in the hands of a great number of owners.

Economical handling is no problem if you have dependable equipment to do the work. Our sales engineer, who is located near you, would like to talk over your material handling methods with you. May he call?

Industrial Brownhoist Corporation

General Offices: Cleveland, Ohio.

District Offices: New York, Philadelphia, Pittsburgh, Detroit, Chicago, San Francisco, St. Louis, New Orleans, Bay City, Mich.

INDUSTRIAL BROWNHOIST

When writing advertisers, please mention ROCK PRODUCTS

LOOK

We will print a cut of the "Good Roads 10x30" Timken equipped fine reduction Rock Crusher in the March 3rd issue of "Rock Products."

Send for bulletin now!

WATCH THIS SPACE!!!

Good Roads MACHINERY

The Good Roads Machinery Co., Inc.
Kennett Square, Penna.

Geo. Boedecker Gravel Company, of Dayton, Ohio, Equipped with Page Slackline Cableway

SPEED—CONTINUOUS PRODUCTION—SIMPLICITY

In slackline operation, the Page Bucket will dig loose or hard material, and load quickly without burying itself. When it is hoisted, the front end comes up first, crowding the gravel back into the bucket and assuring a full load delivered to the hopper. It will carry a full load every trip.

A simple, fool-proof, automatic locking device holds the bucket above the hopper, where it is dumped by gravity. The bucket can be dumped as fast or as slowly as the operator desires—no power is required to dump it.

Speed is guaranteed by quick loading and by the method of dumping. As the entire installation is free from complicated devices, expensive chains, sheaves, etc., the maintenance cost is correspondingly low.

The Page Engineering Company is prepared to furnish complete Cableway installations or buckets with the Cableway Control for any installation. Write for details.

PAGE ENGINEERING CO.

844 RUSH ST.
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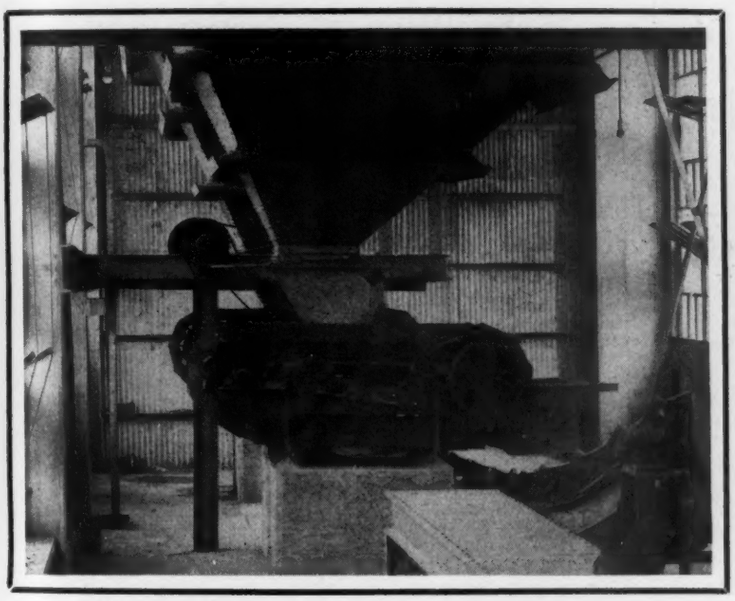
Factors in Plant Efficiency

WEBSTER FEEDERS

Installed in the New Plant of the

WEST PENN CEMENT CO.



Webster Feeders supplying gypsum and clinker to the conveyor which feeds the roll crusher

IN the plant of the West Penn Cement Company, West Winfield, Pa., every effort has been made by the builders to assure the highest possible efficiency. The general design and layout of the plant was carefully planned and carried out, and the selection of the equipment was made with equal care.

Four WEBSTER FEEDERS (overlapping pan type) have been installed in this new plant. These feeders—two of which feed the stone and shale to the raw grinding mills, and the other two feed the gypsum and clinker from storage bins to a belt conveyor, are proving positive and regular in operation—thereby justifying the confidence the West Penn engineers have placed in Webster equipment.

THE WEBSTER MFG. COMPANY
1856 Kostner Avenue
CHICAGO

Buffalo | Cincinnati | Webster-Brinkley Co., Seattle | Cleveland | New York | Philadelphia | Webster-Inglis, Ltd., Toronto | Pittsburgh

WEBSTER

MATERIAL HANDLING EQUIPMENT

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 128

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American Steel & Wire Co.
A. Leschen & Sons Rope Co.

Agitators, Thickeners and Slurry Mixers
Hardinge Co.
Morris Machine Works
Polysius Corp.
F. L. Smidth & Co.

Air Compressors
Chicago Pneumatic Tool Co.
Traylor Eng. & Mfg. Co.

Air Filters
Midwest Air Filters, Inc.

Air Line Oilers
Gardner-Denver Co.

Air Separators
American Miag Corp.
Hardinge Co.
New Haven Sand Blast Co.
Raymond Bros. Impact Pulv. Co.
W. W. Sly Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Alloys (Metal)
Haynes Stellite Co.

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Merrick Scale Co.

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Bags
Valve Bag Co. of America

Bagging Machinery
Valve Bag Co. of America

Ball Bearings
New Departure Mfg. Co.

Balls (Tube Mill, etc.)
Allis-Chalmers Mfg. Co.
Polysius Corp.
W. A. Riddell Co.
F. L. Smidth & Co.

Batchers
Blaw-Knox Co.

Barrels (Steel)
Pittsburgh Steel Drum Co.

Bearings
American Miag Corp.
Coe Mfg. Co.
New Departure Mfg. Co.
Timken Roller Bearing Co.
Webster Mfg. Co.
T. B. Wood's Sons Co.

Bearings (Anti-Friction)
New Departure Mfg. Co.
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Bearings (Collar Oiling)
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Bearings (Radial)
New Departure Mfg. Co.

Bearings (Tapered Roller)
Timken Roller Bearing Co.

Bearings (Thrust)
New Departure Mfg. Co.
Timken Roller Bearing Co.

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Crescent Belt Fastener Co.

Belting
Quaker City Rubber Co.

Bins (Cement, etc.)
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Loomis Machine Co.

Blasting Machines
Hercules Powder Co.

Blasting Powder
Hercules Powder Co.

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Timken Roller Bearing Co.

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Sauerman Bros.

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Komnick Machy. Co.

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Deister Concentrator Co.
Jackson & Church Co.
Komnick Machy. Co.
W. A. Riddell Co.

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Buckets (Dragline)
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Page Engineering Co.
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Buckets (Elevator and Conveyor)
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Owen Bucket Co.
Page Engineering Co.

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S. G. Taylor Chain Co.

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Cross Engineering Co.
Webster Mfg. Co.

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Clamshell Cranes (See Cranes)

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Clay Working Machinery
Bonnot Co.

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W. A. Jones Fdy. & Machine Co.
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Gardner-Denver Co.

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IN all three essentials of an efficient, profitable screen, the Hum-mer is the World's Champion!

First—It will screen more material per square foot of area than any other means.

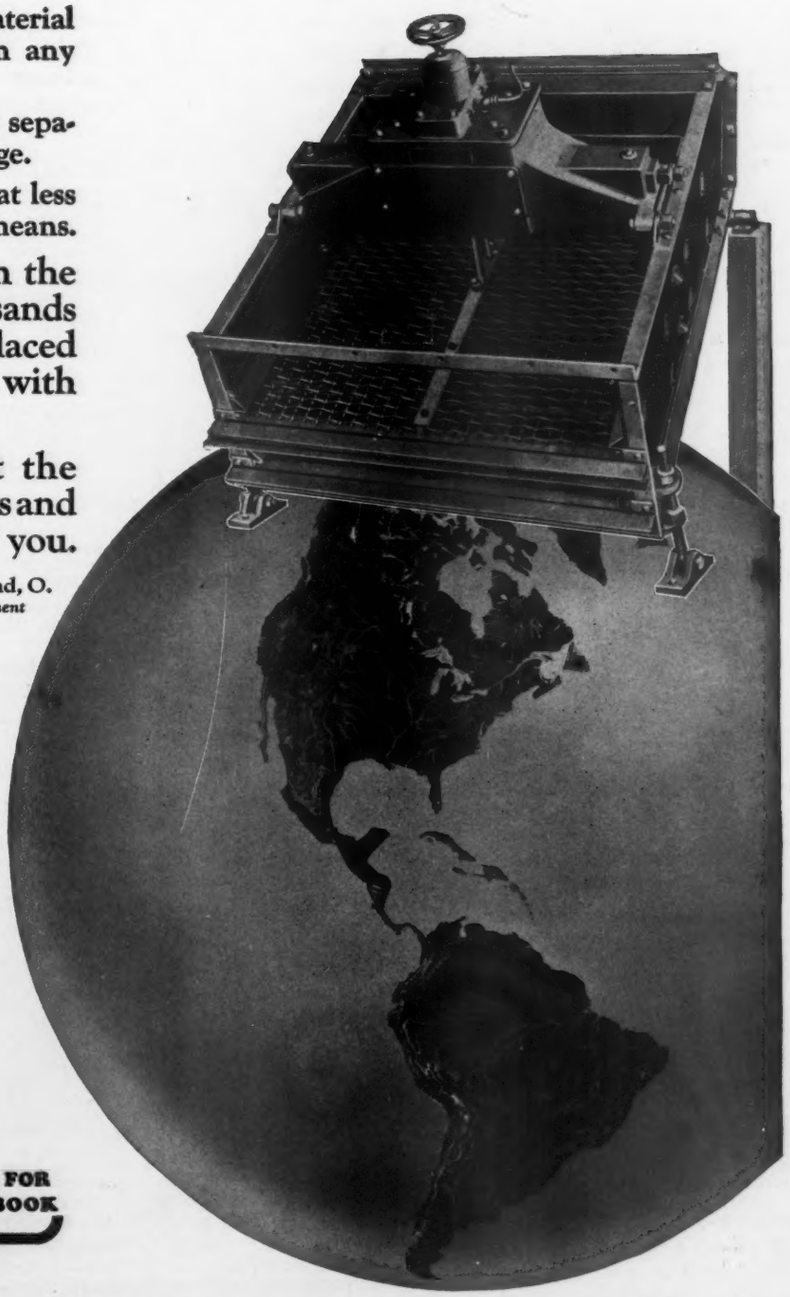
Second—It will make a closer separation, handling larger tonnage.

Third—It will screen material at less cost per ton than any other means.

These facts are based upon the actual experience of thousands of producers who have replaced other means of separation with the Hum-mer process.

Let us show you what the Hum-mer is doing for others and also what it would do for you.

THE W. S. TYLER COMPANY, Cleveland, O.
Mfrs. Woven Wire Screens and Screening Equipment



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Webster Mfg. Co.
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Fawcus Machine Co.
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W. A. Jones Fdy. & Machine Co.
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Ohio Locomotive Crane Co.
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Thew Shovel Co. (Electric, Gasoline & Steam)

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Dings Magnetic Separater Co.

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Williams Patent Crusher & Pulverizer Co.

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Dredge Pipe (See Pipe)

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Loomis Machine Co.

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Gardner-Denver Co.

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Loomis Machine Co.

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Elevators (See Conveyors and Elevators)

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Buda Company
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Engines (Steam)
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Mundy Sales Corp.

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American Miag Corp.

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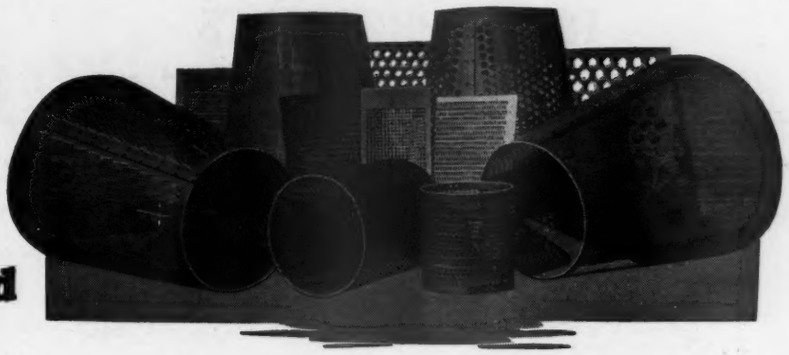
Palmer-Bee Co.
Webster Mfg. Co.

Generators (See Motors and Generators)

Grab Bucket Cranes (See Cranes)

Cross Screens

Perforated Metals



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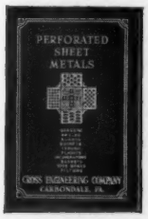


A copy of our catalog will help you to select and specify to best advantage.

Whether it is A-1 quality, prompt shipment or reasonable cost that interests you most; you will find "Cross" screen plates and sections satisfactory.

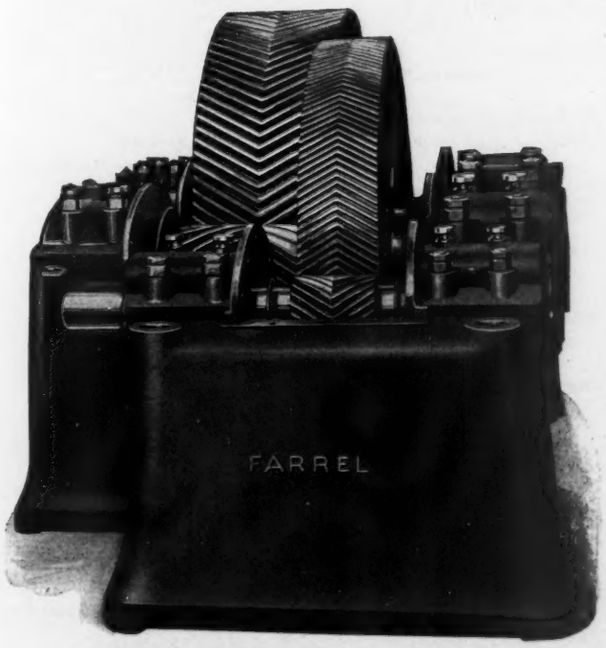
Repeat orders are a necessity to us, and we know to deserve them every shipment must be right.

Ample capacity, a large stock of material and close attention; insure your needs being met when you buy from Cross.

Cross Engineering Company

Office and Works: CARBONDALE, PA.

Send for our new catalog; just off the Press.



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THREE SHAFT TYPE

Kiln drives are recognized to be stressed more highly than any other drives. The clinker, while passing through the kiln, imposes severe and sudden overloads on the gearing.

We have made a special series of three-shaft double reductions suitable for this work. They are strongly built, are fitted with Sykes continuous tooth herringbone gears, which are the strongest known, and are so designed that the motor is a distance from the kiln, and is not affected by the radiation of heat.

Write for gear book

Specify the Gear With a Backbone

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SUCCESSORS TO
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BUFFALO, N.Y. AND BIRMINGHAM IRON FOUNDRY OF DERBY, CONN.
ADDRESS REPLIES TO THIS ADVERTISEMENT TO BUFFALO PLANT
344 VULCAN ST., BUFFALO, N. Y.

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Acheson Graphite Co.

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Giving a big output in Rock— and *keeping it up*

You've never seen another gasoline shovel that can even class with the Gas+Air BUCYRUS-ERIE for big yardage in hard material.

Here's a gas shovel with *direct-connected crowding and swinging engines,* driven by compressed air—that helps the powerful gasoline motor when hoisting through a rock cut. Instead of stealing power from the hoist, the "crowd" and "swing" *add extra power.*

And there's Smoothness and Flexibility that protects the entire machine. The air engines cushion all shocks.

The owner of the Gas+Air BUCYRUS-ERIE shown in the photo reports:

"We are more than pleased—the Gas+Air ERIE is getting more yardage than our operator was ever able to dig with a shovel this size, and has plenty of power to back it up. Best machine we ever used."

The Big Profits are made by getting Big Production—and the Gas+Air BUCYRUS-ERIE gives you Big Production as no other machine can.

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Erie, Pa.
Evansville, Ind.

BUCYRUS ERIE

Branch offices and representatives everywhere

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McLanahan-Stone Mach. Co.
Orville Simpson Co.
Polysius Corp.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
Sturtevant Mill Co.
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Traylor Eng. & Mfg. Co.
Traylor Vibrator Co.
W. S. Tyler Co.
Universal Vibrating Screen Co.
Williams Patent Crusher & Pulverizer Co.

Separators, Air (See Air Separators)

Separators (Magnetic)
Dings Magnetic Separator Co.

Separators (Slurry)
F. L. Smidth & Co.

Shafting
T. B. Wood's Sons Co.

Sharpening Machines, Drill (See Drill Sharpening Machines)

Shovels (Steam, Gas, Electric, Diesel, Oil)
Bucyrus-Erie Co.
Industrial Brownhoist Corp.
Insley Mfg. Co.
Link-Belt Co.
Marion Steam Shovel Co.
Monighan Machine Co.
Northwest Engineering Co.
Orton Crane & Shovel Co.
Owen Bucket Co.
Thew Shovel Co.

Shovels (Revolving Caterpillar)
Marion Steam Shovel Co.

Signals (Mine and Quarry)
Traylor Vibrator Co.

Silos
Burrell Eng. & Const. Co.

Skips
Link-Belt Co.

Skip Hoists and Skips
R. H. Beaumont Co.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Slings (Wire Rope)
American Cable Co.
A. Leschen & Sons Rope Co.

Slugs (See Grinding Balls and Nuggets)

Speed Reducers
Falk Corp.
Farrel-Birmingham Co., Inc.
D. O. James Mfg. Co.
W. A. Jones Fdy. & Machine Co.
R. D. Nuttall Co.
Palmer-Bee Co.
Stephens-Adamson Mfg. Co.

Spouts, Chutes (See Chutes and Chute Liners)

Sprockets and Chain
Jeffrey Mfg. Co.
W. A. Jones Fdy. & Machine Co.
S. G. Taylor Chain Co.

Steam Specialties
Penberthy Injector Co.

Steel Bars
Timken Roller Bearing Co.

Steel (Electric Furnace)
Timken Roller Bearing Co.

Steel Fabrication
H. K. Ferguson Co.

Steel (Open Hearth)
Timken Roller Bearing Co.

Steel Plate Construction
Hendrick Mfg. Co.
McGann Mfg. Co., Inc.

Steel (Special Alloy—See also Manganese Steel)
Haynes Stellite Co.
Timken Roller Bearing Co.

Steel (Special Analysis)
Timken Roller Bearing Co.

Stellite
Haynes Stellite Co.

Stokers
Raymond Bros. Impact Pulv. Co.

Stone Grapples—See Grapples (Stone)

Storage Equipment
R. H. Beaumont Co.
Sauerman Bros.

Tampers
Chicago Pneumatic Tool Co.

Tanks
Blaw-Knox Co.
Galland-Henning Mfg. Co.
McGann Mfg. Co., Inc.
Smith Engineering Works

Testing Sieves and Shakers
W. S. Tyler Co.

Thickeners
Hardinge Co.
Traylor Vibrator Co.

Tools, Drill (See Drilling Accessories)

Tool Steel
Haynes Stellite Co.

Torches
Haynes Stellite Co.

Track Equipment
Easton Car & Construction Co.
L. B. Foster Co.

Track Shifters
Nordberg Mfg. Co.

Trailer Cranes (See Cranes)

Transmission Machinery
Allis-Chalmers Mfg. Co.
Farrel-Birmingham Co., Inc.
D. O. James Mfg. Co.
W. A. Jones Fdy. & Machine Co.
Kritzer Co.
Stephens-Adamson Mfg. Co.
Timken Roller Bearing Co.
T. B. Wood's Sons Co.

Trenchers (Wheel and Ladder Type)
Barber-Greene Co.

Troughs
Cross Engineering Co.

Truck Cranes (See Cranes)

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Seamless Steel)
Timken Roller Bearing Co.

Tunnelling Machines
Bucyrus-Erie Co.

Turntables
Easton Car & Const. Co.

Underground Loaders
Bucyrus-Erie Co.
Thew Shovel Co.

Valves
Haynes Stellite Co.

Vibrating Screens (See Screens)

Wall Board Dryers
Coe Mfg. Co.

Washers (Sand, Gravel and Stone)
Allis-Chalmers Mfg. Co.
Deister Concentrator Co.
Eagle Iron Works
Galland-Henning Mfg. Co.
McLanahan-Stone Mach. Co.
F. L. Smidth & Co.
Smith Engineering Works.
Stephens-Adamson Mfg. Co.
W. Toepfer & Sons Co.
Traylor Eng. & Mfg. Co.

Weighing Equipment
Merrick Scale Mfg. Co. (Automatic Proportioning).
Schaffer Poidometer Co.

Welding and Cutting Apparatus
Haynes Stellite Co.

Well Drills (See Drills, Well)

Wheels (Car)
Eagle Iron Works
Easton Car & Construction Co.
Vulcan Iron Works.

Winches and Capstans
Mundy Sales Corp.

Wire Cloth
W. S. Tyler Co.

Wire Rope
American Cable Co.
American Steel & Wire Co.
A. Leschen & Sons Rope Co.
Williamsport Wire Rope Co.

Wire Rope Fittings
American Cable Co.
A. Leschen & Sons Rope Co.

Wire Rope Slings
American Cable Co.

Wire (Welding)
Haynes Stellite Co.

Worm Gears (See Gears)

Zinc
New Jersey Zinc Co.

Toepfer screens

SCREENS and perforated sheet metals for every purpose have been made by us for nearly three-quarters of a century. This long period in business makes us the oldest manufacturers of perforated sheet metals in America.

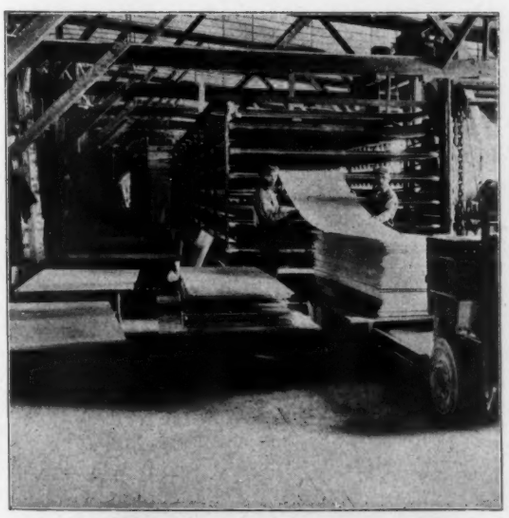
The reputation for a quality product and honest dealing gained during this time assures the buyer of Toepfer Screens positive satisfaction with the purchase. We are fully equipped to perforate sheet metal and steel plates with any size round holes, or with any other shaped perforations at any practical spacing that may be required.

TOEPFER PRODUCTS

Sand Washers, Elevators, Bin Gates, Washing Screens, Feeders, Grizzlies, Conveyors, Perforated Metals.

W. TOEPFER & SONS COMPANY
Milwaukee **Wisconsin**

DRYING COE MACHINERY



The above illustration shows the discharge end of a Coe Roller Dryer handling plaster wallboard in the Montreal plant of the Canada Gypsum & Alabastine, Ltd.

The Coe Manufacturing Co.
417 Bank Street **Painesville, Ohio**

MODERNIZE YOUR DRYING PROCESSES

THAT'S what the Canada Gypsum & Alabastine, Ltd., did when they scrapped all their old style tunnel kilns at their plant at Caledonia, Ontario.

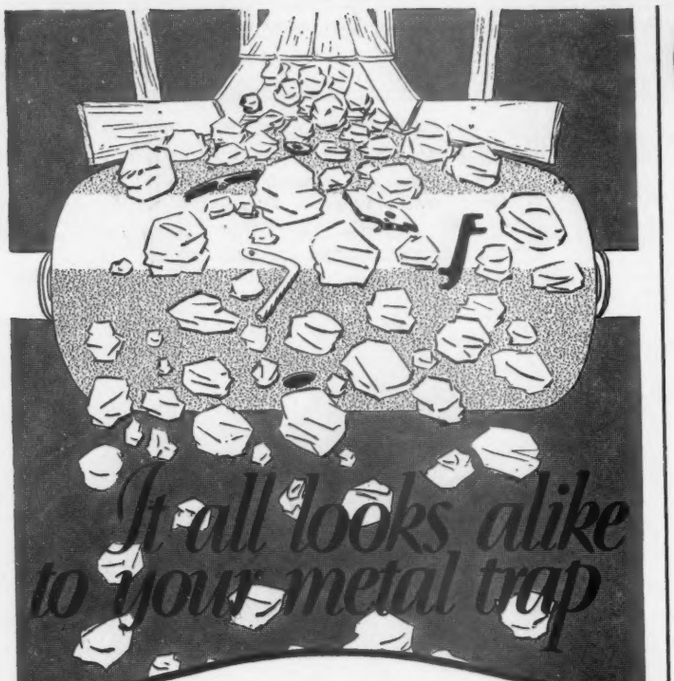
For this plant they have purchased a

COE ROLLER DRYER

having a daily capacity of 200,000 feet of plaster wall board.

Their decision to take this advance step grew out of the demonstrated lowering of the cost of the board-drying operation together with the increase in the proportion of first grade boards in their plant in Montreal.

What Coe Roller Dryers are doing to lower drying costs and cut down spoilage for the Canada Gypsum & Alabastine, Ltd., the Schumacher Wallboard Company, of Los Angeles, The Beaver Products Company, and many others, they will do for you.



It all looks alike to your metal trap

ARE you depending on a metal trap in your crusher to catch the destructive tramp iron working into your machinery? A metal trap isn't particular. It takes rock as readily as tramp iron or steel. Before long it is full—of crushed material—and the iron and steel start slipping through. You know what to expect—wrecked crushers, your plant shut down awaiting the costly repairs that must be made before operations can be resumed.

Dings offers the only certain protection. Whether the trap is empty or full, the Dings Magnetic Separator is throwing an impassable barrier of magnetic separation before your crusher. Dangerous tramp iron and steel can't get through. Our engineers will show you.

Dings Magnetic Separator Company

803 Smith Street Milwaukee, Wis.

Established 1899

Boston 304 Rice Bldg. — San Francisco 419 Call Bldg.

New York City 30 Church Street — Seattle 2208 First Ave. South

Branch offices in all principal cities

Dings High Intensity MAGNETIC SEPARATION

RP 2-4-Gray

Gear Strength

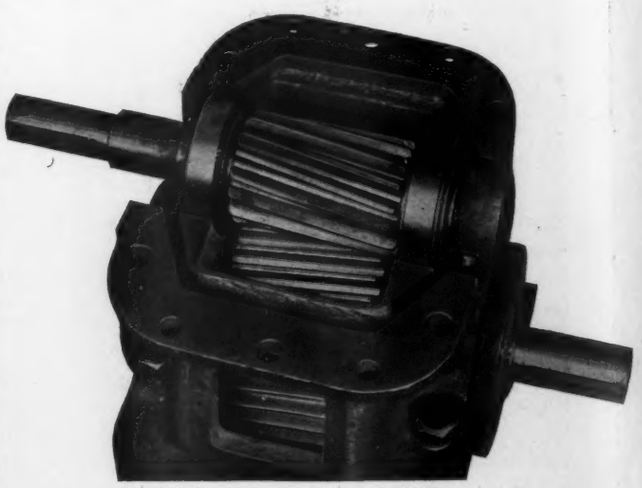
A SPEED REDUCER can be no stronger than the gears contained in the case. That is why we use Nuttall 7½-degree helical gears in all Nuttall speed reducers —no gears are stronger. In designing the tooth form of Nuttall helical gears the most favorable portion of the involute curve was chosen, giving a pressure angle of from 20 to 23 degrees, depending on the ratio. Besides this the long and short addendum feature and a certain percentage of stubbing were incorporated into the design. The result is a tooth thick at the base where strength is needed, and wide at the pitch line where wear takes place. The helical tooth form has 50 per cent more rolling action in its engagement, and from 50 to 100 per cent more strength than the 14½-degree standard involute tooth.

Send for our Speed Reducer Bulletin No. 59

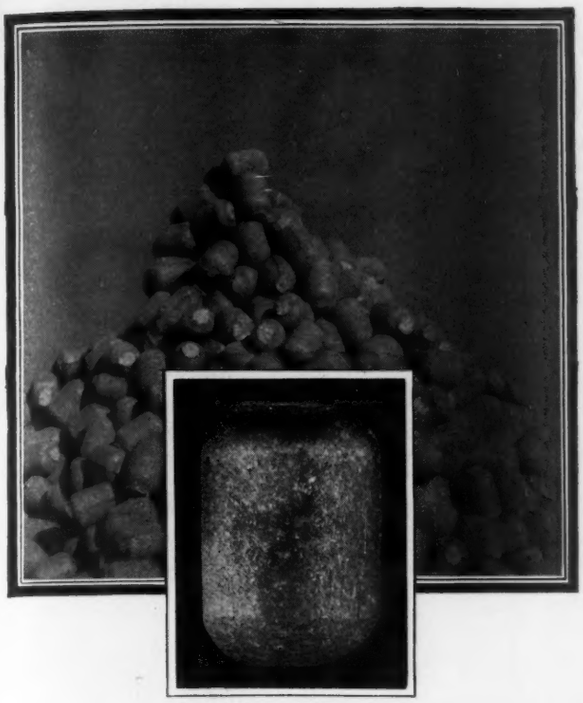
R. D. NUTTALL CO., Pittsburgh, Pa.

Philadelphia Chicago Cincinnati Dallas
Houston Tulsa Los Angeles

Lyman Tube & Supply Co., Montreal and Toronto, Canada



Nuttall



Cylpebs

(Patented) (Trademark Reg.)

Cylpebs are cylindrical metallic grinding bodies for Tubemills, made of a special mixture of white iron under laboratory control. They possess great durability, and have considerably greater grinding surface than have grinding balls. Being cylindrical in shape, they can strike along an entire line, where the spherical grinding bodies strike at only one point.

Shown at left (inset) is a Cylpeb of the 1" x 1¼" size, photographed actual size. Cylpebs are also made in ⅝" x 1" size. Shipment from stock. Prices and users' reports on request.

F. L. SMIDTH & CO.

(Inc. 1895)

ENGINEERS

50 Church Street — DESIGNERS AND EQUIPPERS OF CEMENT MAKING FACTORIES — New York City

Factory, Foundry and Laboratory—Elizabeth, N. J.

Your Guarantee of LOW COST HAULAGE

VULCAN Locomotives—both steam and gasoline—are favorites of long standing on all sorts of industrial hauling jobs. On one operation steam may provide the logical means of motive power. On another, gasoline may have the advantage. But whichever it is, there is always this certainty—that a Vulcan—of the size and type best suited to the particular job, is a positive guarantee of LOW COST HAULAGE. Of that point there is no doubt, for it is being proved more definitely every day on dozens of jobs with conditions comparable to your own.

VULCAN IRON WORKS of Wilkes-Barre, Pa. U.S.A.

STEAM
GASOLINE
ELECTRIC
LOCOMOTIVES

50 Church Street
NEW YORK
McCormick Bldg.
CHICAGO

—for driving wedge furnaces, too!

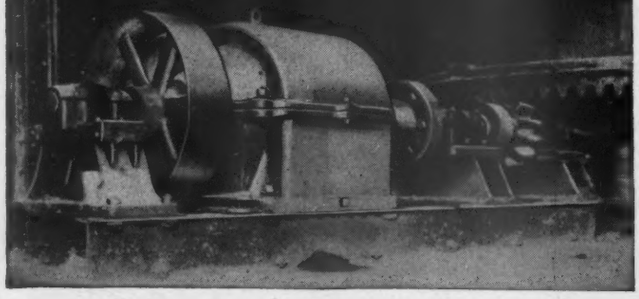
The staunch, rigid construction of Palmer-Bee Speed Reducers makes them particularly adaptable for driving wedge roasting furnaces.

Not once during the five years we have been supplying Palmer-Bee Reducers for drives of this kind have they failed to render the faultless service and satisfaction expected of them.

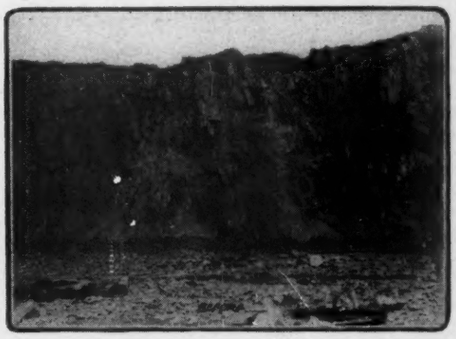
Spur and Herringbone Types

The installation—One of a battery of eight Palmer-Bees in a large copper smelting plant in Quebec.

PALMER-BEE CO.
1705-1715 Poland Avenue
Detroit



A Successful
Quarry Blast



29,750 pounds of dynamite brought down an estimated total of 150,000 tons of stone in this large quarry blast at the Edison Portland Cement Co., New Village, N. J. Instantaneous detonation with Cordeau-Bickford gave an approximate average of 5 tons of rock per pound of explosive.

CORDEAU
DETONATING FUSE
BICKFORD

Furnished by Ensign-Bickford, or any of the explosives companies

THE ENSIGN-BICKFORD COMPANY
SIMSBURY, CONNECTICUT

Original Manufacturers of Safety Fuse—Established 1836

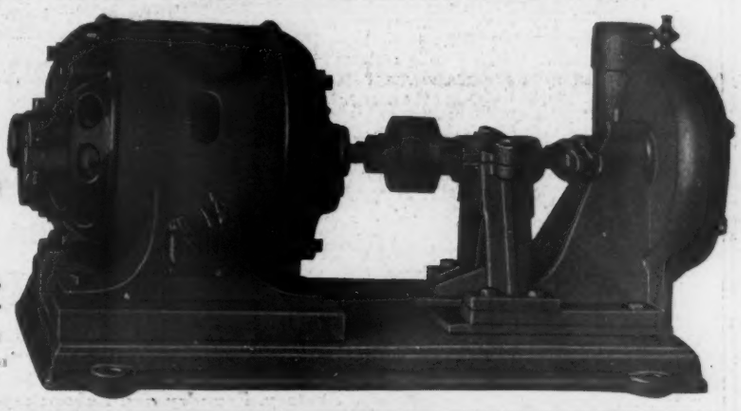
Coast Mfg. & Supply Co. Livermore, Cal.
Western Distributors: National Fuse & Powder Co. Denver, Colo.
Canadian Distributors: Canadian Safety Fuse Co. Brownsburg, P. Q.

Everywhere: Any of the Powder Companies

Wood's Flexible Couplings
Take the Punishment

They absorb the shocks and intermittent strains of push and pull that are unavoidable in even the most perfect direct connected machine set-ups.

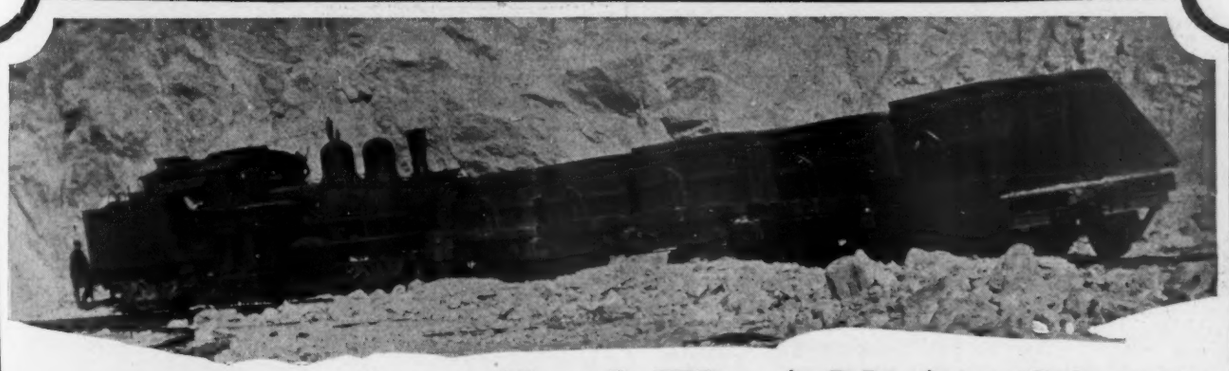
Extremely simple construction—two cast iron flanges with lugs cast integral, separated by a specially constructed leather disc—presents nothing that can get out of order and with the carefully planned design guarantees the service satisfaction characteristic of Wood's equipment.



May we tell you of a few successful applications?

T. B. Wood's Sons Co.
Chambersburg, Pa.

Makers of Shafting, Hangers, Couplings, Rope Drives, Pulleys, Friction Clutches, Pillow Blocks, Belt Contactors, Speed Reducers, Conveyors and Ball Bearings.



Write for a Shay catalog

Need We Add Anything?

"WE know that the Shay is the surest power in the market. It clings to the roughest track. It handles a larger tonnage than any other locomotive of its size. It is very economical."

Need we add anything to this comment from the President of a mid-western concern?

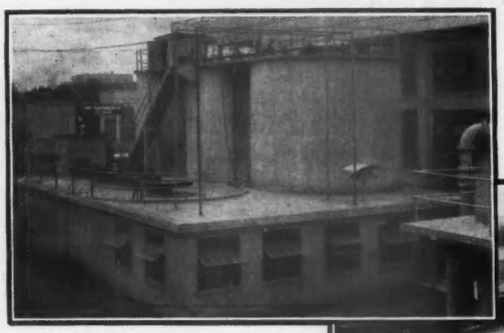
Whatever the conditions in the quarry—no matter how temporary the track, nor how severe the grades and curves—Shays serve satisfactorily year after year, giving the dependable service that means low-cost stone hauling.

LIMA LOCOMOTIVE WORKS
Incorporated
17 East 42nd St., New York
Lima, Ohio

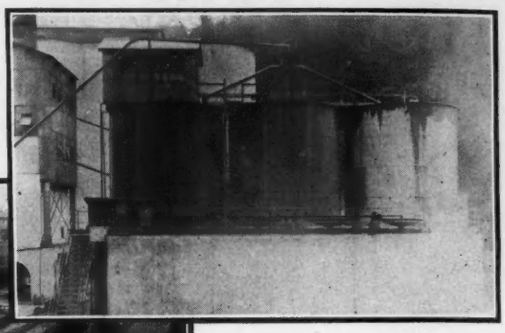
LIMA
Shay Geared LOCOMOTIVES

AGITATORS for CEMENT SLURRY

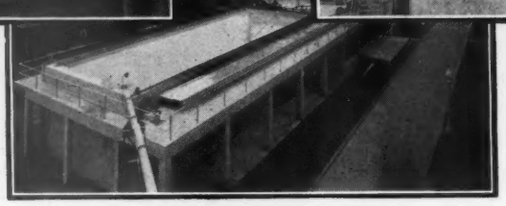
Mechanical and Air Agitation



CORRECTING BASINS



MIX BASINS



STORAGE BASINS

F. L. SMIDTH & CO.

(Inc. 1895)

ENGINEERS

50 Church Street — DESIGNERS AND EQUIPPERS OF CEMENT MAKING FACTORIES — New York City

Factory, Foundry and Laboratory—Elizabeth, N. J.

YOUR BELTING *joined with* **CRESCENT BELT FASTENERS** *stays joined!*

Crescents are on in a jiffy and on to stay—yet to shorten a Crescent joined belt is but a matter of a few minutes.

But the big advantage is that the belt will give its best service for its longest life without constant costly interruptions.

CRESCENT BELT FASTENER CO.

247 Park Avenue — New York, N. Y.

CRESCENT BELT FASTENERS

Recommended by belting manufacturers as the best

From Alaska to Florida In Winter and Summer

GREDAG

LUBRICANTS

put a cushion between gear teeth, keep bearing surfaces apart, absorb shocks, resist pressures and prevent wear, without waste of power.

Grades for every purpose. Send for recommendations as made by leading manufacturers of power shovels, cranes, hoists and other material handling equipment.

Gredag contains Acheson Electric Furnace Graphite, 99.9% pure and characterized by its freedom from gritty impurities. It improves all metal surfaces and adds to the ruggedness of the grease body.

Write for fifty page descriptive catalogue, price list and nearest source of supply

ACHESON GRAPHITE COMPANY

Niagara Falls, N. Y.

Even though the track is frozen in and covered with snow, several men are doing the work ordinarily done by a large track gang.

Shifting Track in a Quarry

IN large quarries where track must be moved frequently at the face, or on the dump pile, the Track Machine will prove a great labor and time saver. On this job the machine paid for itself out of labor savings in 86 days of operation. Write for Bulletin KS-8.

Nordberg Mfg. Co., Milwaukee, Wis.

THE NORDBERG PATENTED
TRACK MACHINE

TRAYLOR

bulldog

Gyratory Crusher

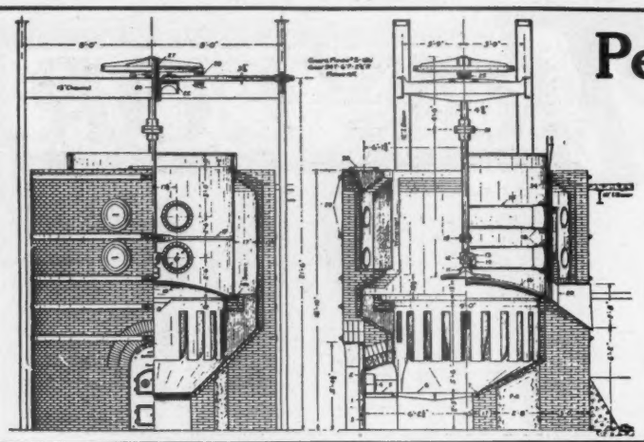
THE Traylor Bulldog Gyratory Crusher is endowed with a number of exclusive features that combine to make this machine the most highly developed gyratory today available. Traylor engineers have for more than thirty years been accumulating a vast store of experience in the design, manufacture and operation of this type of equipment. Small wonder, then, that the Bulldog Gyratory of today is the highly developed and successful machine that it is.

If you contemplate installing a gyratory, you'll certainly be interested in learning about the special features offered in the Traylor Bulldog.

Just ask for Bulletin No. 1100

TRAYLOR ENGINEERING AND MFG. CO.
Allentown, Penna.

NEW YORK, 30 Church St. | CHICAGO, 1414 Fisher Bldg. | LOS ANGELES, 362 I. W. Hellman Bldg.
SALT LAKE CITY, 100 W. 2nd South St. | SEATTLE, 815 Alaska Bldg.
TIMMINS, ONTARIO, CANADA, Moore Block
Export Department, 104 Pearl St., New York City—Cable Address: "Forsal[illegible]"
Foreign Sales Agencies: London, Rangoon, Johannesburg, Lima, Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro
European Works—Usines Carels Freres, Ghent, Belgium



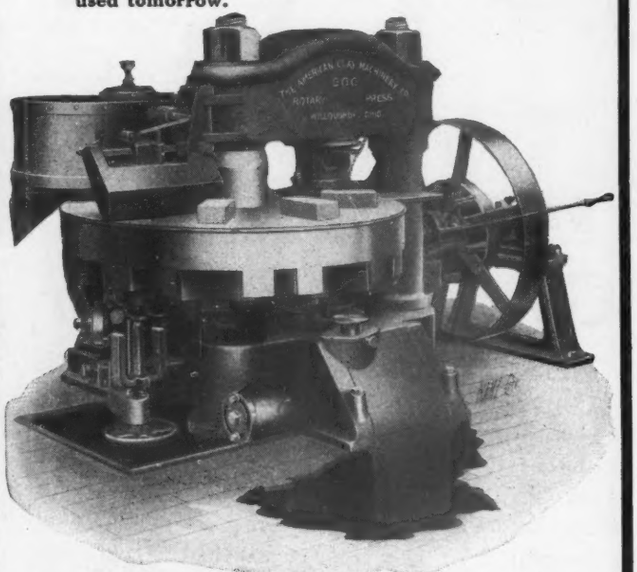
Performance Unparalleled

DURING more than forty years of service to the lime and gypsum industries, our consistent policy has been to combine in all of our products the best of engineering ability and highest quality materials. Ehrsam Calcining Kettles are built this way—aided by a vast accumulation of experience with this kind of equipment. In performance they are unparalleled.

The J. B. Ehrsam & Sons Mfg. Company
Enterprise, Kansas

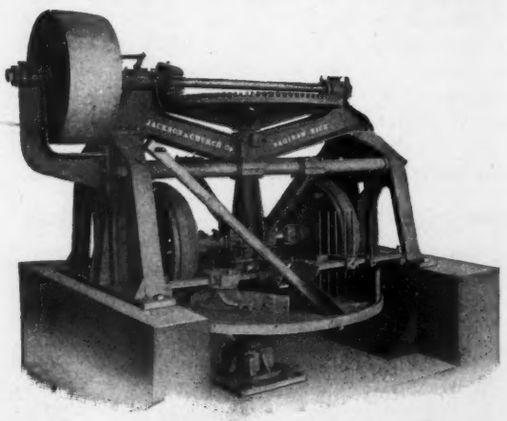
OUR line of machinery for the manufacture of Sand-Lime Brick is complete. The market for these brick is on a rapid upward climb. If you have the material, why let it lie idle? Instead, let us show you how you can realize real profits!

A modest machinery equipment, a few men, and you can make brick today which can be used tomorrow.



W. A. RIDDELL COMPANY, *Successor to*
The Hadfield-Penfield Steel Company
Bucyrus, Ohio

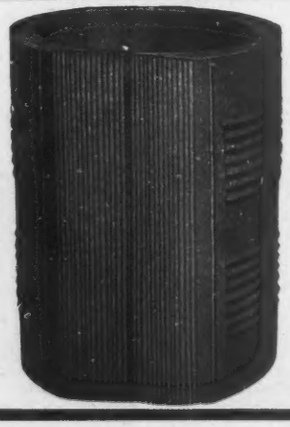
GRINDING PANS



Performance is the Real Test

of any grinding pan. The heavy construction used in the SAGINAW WET PAN guarantees continuous service and low maintenance costs.

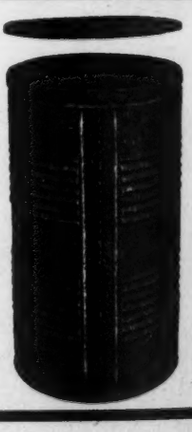
JACKSON & CHURCH
SAND LIME BRICK MACHINERY **company** SAGINAW, MICH. U. S. A.



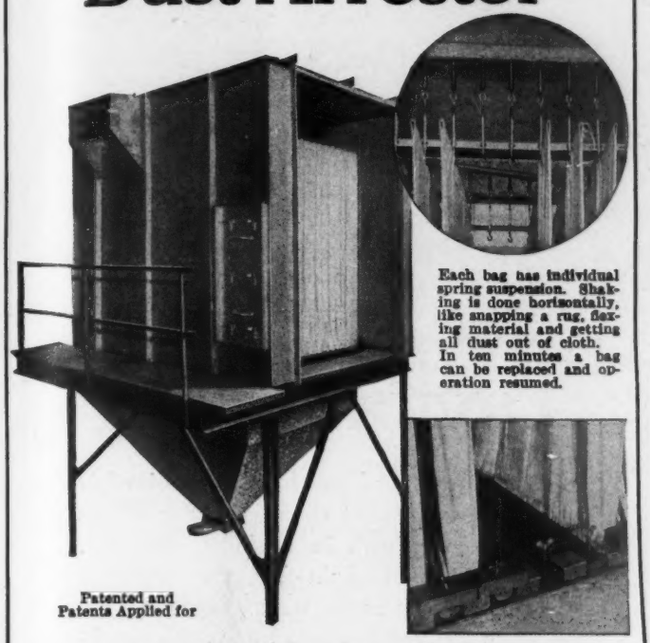
Save three Ways!

SPACE—**weight—freight!** Three big ways you save when Hammerall Steel Drums are used. Only one of these would be sufficient to justify thoughtful consideration. Yet here are three big advantages of steel drums that you may be overlooking. At any time you say the word, we are ready to tell you in detail just how these savings are effected.

PITTSBURGH STEEL DRUM CO.
Pittsburgh, Pa.



New Type Dust Arrestor



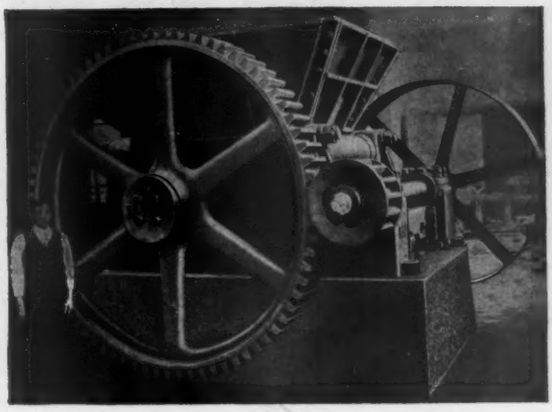
Each bag has individual spring suspension. Shaking is done horizontally, like snapping a rug, flexing material and getting all dust out of cloth. In ten minutes a bag can be replaced and operation resumed.

Patented and Patents Applied for

"Quality Equipment Pays in the End"

THE NEW HAVEN SAND BLAST CO.

New Haven, Conn. Cleveland, Ohio



IF you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.

Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.

LOCOMOTIVE OHIO CRANE

Steam—Gas—Electric

Hook, Clamshell, Dragline Magnet or Pile Driver Service

10 to 50 Ton Capacities

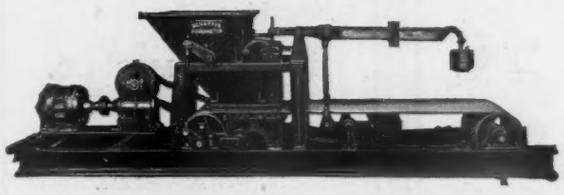
The Crane with the 10 Year Guarantee

Catalog on Request

THE OHIO LOCOMOTIVE CRANE CO.

High Street, Bucyrus, Ohio

SCHAFFER POIDOMETER



ALMOST HUMAN

Schaffer Poidometers are the mechanical brains of the plant. They are more than that—they are guardians of the quality standards you have set for your product—they prevent waste and assure accuracy and maximum economy.

If you are handling a variety of materials, arrange your Poidometers in batteries—set one for each material and for the proportion wanted—then forget it! The Poidometer will do your bidding better than your most loyal employee. If any machine is not getting its full quota of material, the entire battery will automatically stop. Space does not permit of a thorough explanation of the many cost-saving qualities of Schaffer Poidometers.

WRITE FOR FULL DETAILS

SCHAFFER POIDOMETER CO.

2828 Smallman, Pittsburgh, Pa.

Slackline

CABLE DRAG SCRAPERS

for handling sand, gravel, stone and other bulk materials. Lowest first cost. Ideal for stock piling.

SLACKLINE EXCAVATORS

for excavating sand and gravel in dry or wet pits over long hauls.

It Digs—It Elevates—It Conveys
One Man and One Machine Does It All

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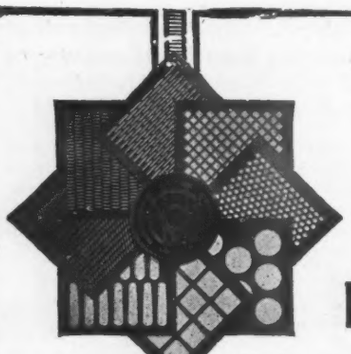
Scraper

313 Arch Street
Philadelphia, Pa.

R·H·BEAUMONT CO

310 S. Michigan Ave.
Chicago, Ill.



Time to Re-Screen

IT'S not long now before the dredges or drag lines start to work.

It's time to re-screen.

Let Hendrick furnish the screens. Any gauge metal, any curvature you want, any style punching.

Makers of Mitco Interlocked Steel Grating, Mitco Shur-Site Stair Treads and Mitco Armorgrids

HENDRICK MFG. CO.
47 Dundaff St., Carbondale, Pa.
New York Office: 30 Church St.
Pittsburgh Office:
904 Union Trust Bldg.
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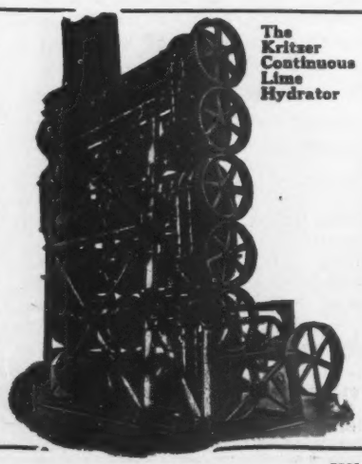
738 West Diamond Ave.

Taylor Chain

FOR years on end, we have specialized in the manufacture of **chain.** All our efforts have been put forth in a single direction, namely — to build chain for every purpose that would stand more strain, wear longer, and hence deliver the maximum of satisfaction and service to the user.

Ask any user of Taylor Chain how well these aims have been achieved.

S. G. TAYLOR CHAIN CO.
Established 1873
144 South Dearborn Street
Chicago, Ill.



The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

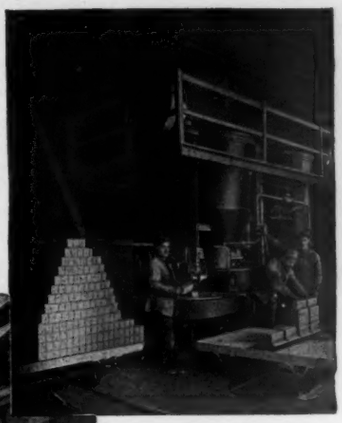
THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

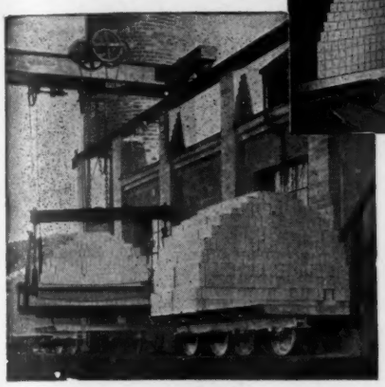
A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
515 West 35th Street CHICAGO, ILL.

Overhead is "Down"

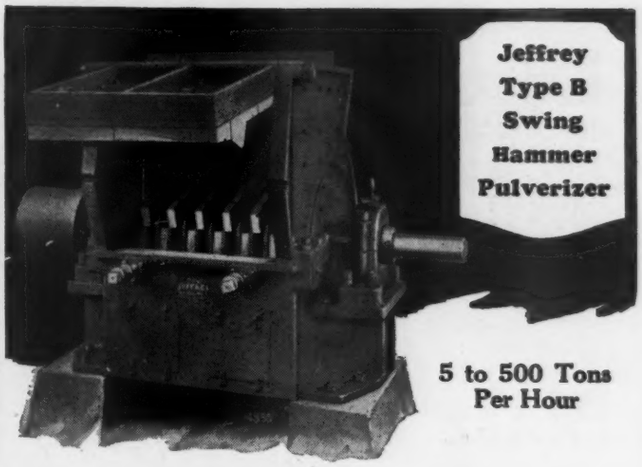
IN a large number of plants the installation of the Komnick Process Sand-Lime Brick Machinery has resulted in decided drops in plant overhead. The utilization of surplus sand and lime in the production of sand-lime brick is in many instances a big step toward the elimination of plant wastes. And the elimination of waste means more profit—of course.





We are prepared to furnish a complete line of equipment for a plant of any capacity.

KOMNICK MACHINERY COMPANY, Inc.
Lafayette Building, Detroit, Michigan



5 to 500 Tons Per Hour

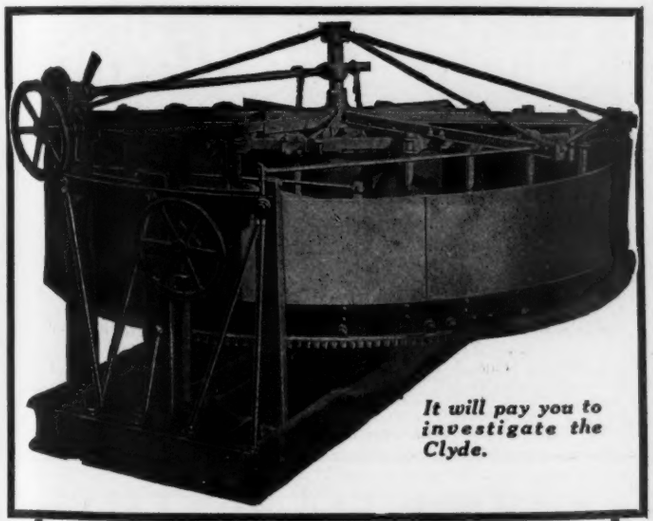
Jeffrey Swing Hammer Pulverizers With Ball Bearings

To reduce limestone and shale for the cement mill, this Jeffrey Swing Hammer Pulverizer is fitted with ball bearings requiring very little attention or grease for lubricating.

Jeffrey builds heavy duty Type B Swing Hammer Pulverizers in various sizes for reducing from 5 to 500 tons of rock an hour.

Catalog 368-C describes Jeffrey Swing Hammer Pulverizers.

The Jeffrey Manufacturing Co.
935-99 N. Fourth St., Columbus, Ohio



It will pay you to investigate the Clyde.

To let good enough alone has never been a policy applied to the "Clyde" Hydrator. On the contrary, it has been improved year by year. Now, again, new and improved features have been added that place the "Clyde" even further ahead in its field than it has ever been before.

Write for details

H. MISCAMPBELL
Patentee and Sole Manufacturer
Aug. 14, 1923.....1464722
DULUTH MINNESOTA

ENGINEERS

You can save money by using standardized methods

FERGUSON can show you how you can save time and money by using standardized methods in construction and equipment. It is possible that this organization, familiar as it is with problems of the cement industry, can make recommendations that will result in important economies for you.

Write, wire or phone for a Ferguson executive.

THE H. K. FERGUSON COMPANY
Hanna Building . . . Cleveland, Ohio
Phone: SUperior 3620
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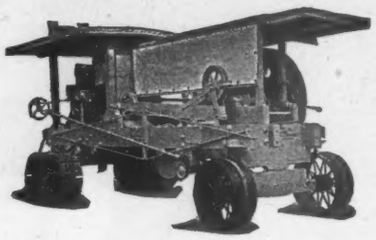
Ferguson ENGINEERS

Loomis "Clipper"



Blast Hole Drills

"Clipper" Drills are being used under most severe service conditions all seasons of the year by those demanding maximum efficiency, durability and economical maintenance. In none of these rigid requirements has the "Clipper" fallen short of the strict demands of the most critical operators.

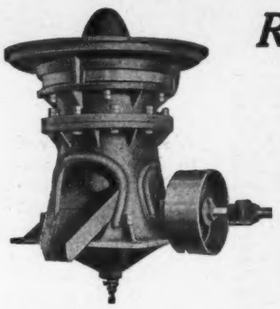
Fast drillers—few repairs—long life.

(Furnished with steam, gasoline, compressed air or electric power)

THE LOOMIS MACHINE COMPANY
(Established 1842)
15 E Street - - - Tiffin, Ohio

BACON-FARREL
ORE & ROCK
CRUSHING-WORLD KNOWN
ROLLS-CRUSHERS

EARLE C. BACON, INC. ENGINEERS
26 CORTLANDT ST., NEW YORK



Read What—

Ross Louthan, Secy.-Treas., The Northern Indiana Sand and Gravel Co., says—after using Austin Crushers for 10 years:

"We wish to say that should conditions warrant our purchase of more equipment for crushing and screening it will certainly be Austin."

Catalog sent at your request

AUSTIN MANUFACTURING COMPANY
400 N. Michigan Ave. Chicago, Ill.

J. C. BUCKBEE COMPANY
ENGINEERS
FIRST NATIONAL BANK BUILDING
CHICAGO

Builders of Cement, Rock Crushing and Gravel Plants for Twenty Years

DESIGN—CONSTRUCTION—OPERATION
REPORTS—INVESTIGATIONS

American Steel & Wire Company's
American Wire Rope
and AERIAL WIRE ROPE TRAMWAYS

AMERICAN STEEL & WIRE COMPANY
Sales Offices: Chicago, New York, Boston, Atlanta, Birmingham, Cleveland, Worcester, Philadelphia, Pittsburgh, Buffalo, Detroit, Cincinnati, Baltimore, Wilkes-Barre, St. Louis, Kansas City, Minneapolis-St. Paul, Oklahoma City, Memphis, Dallas, Denver, Salt Lake City, *San Francisco, *Los Angeles, *Portland, *Seattle. **United States Steel Products Co.*

ALL DOWN THE LINE—

Every last man in your plant can profit by reading ROCK PRODUCTS regularly. It will help him to bring new interest and new efficiency to his job.

Rock Products
With which is Incorporated CEMENT-ENGINEERING NEWS Founded 1896
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We produce:

☐ Crushed Stone	☐ Gypsum
☐ Sand & Gravel	☐ Phosphate
☐ Glass Sand	☐ Cement
☐ Lime	☐ Slate
☐ Sand-Lime Brick	☐ Talc

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See to it that ROCK PRODUCTS reaches you regularly—and pass it around! Subscriptions for the keymen would be mighty good investments.

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Please enter my subscription to ROCK PRODUCTS for.....year.... (three years $5.00, one year $2.00—please state which. You save a dollar by subscribing for three years), for which we enclose $.....

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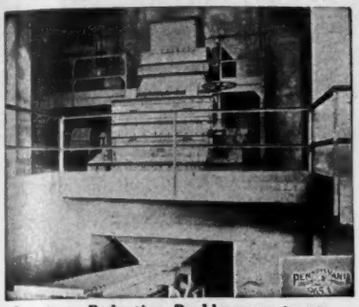

preparing Primary Crusher output for pulverizing in one dependable reduction.

UNBREAKABLE STEEL FRAME.

ADJUSTABLE STEEL CAGE.

POSITIVE TRAMP IRON PROTECTION.

50 "Pennsylvania" types and sizes for Primary, Secondary and Finer reductions in cement, lime and gypsum plants.

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Liberty Trust Bldg. PHILADELPHIA

Put your Reduction Problems up to us.

New York Pittsburgh Chicago

HYMAN-MICHAELS COMPANY

Headquarters for

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RAILWAY MACHINERY

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NEW AND RELAYING

We Buy and Sell Complete Electric Railway Material and Railway Machinery, New and Relaying Rails, Motors and Turbines

Best Price—Quick Delivery

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Walking Dragline Excavator

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STURTEVANT

Crushing, Granulating, Pulverizing, Shredding, Air-Separating, Screening, Grading, Mixing, Weighing, Sampling, Elevating and Conveying Machinery

Standardized and special units ready to erect.

ENGINEERS, DESIGNERS, CONSULTANTS, ERECTORS, OPERATORS

STURTEVANT MILL CO. HARRISON SQUARE Boston, Mass.

Saves Midwest Filtered Air

Your compressors and engines from dust wear, shut-downs and the consequent maintenance and replacement expense that is certain to follow when unfiltered air is used.

The daily costs due to dust troubles are far in excess of the cost of Midwest Filtered Air.

MIDWEST AIR FILTERS INCORPORATED

BRADFORD, PA. Offices in Principal Cities

Since 1854

my firm has been the leading manufacturer of automatic machines and complete plants for the production of

SAND LIME BRICK

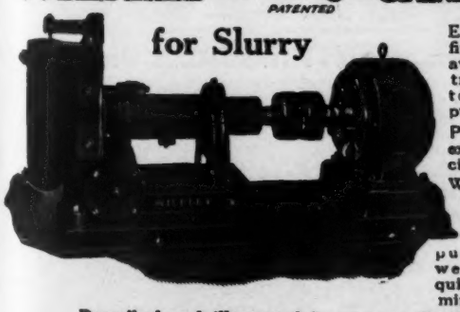
DR. BERNHARDI SOHN

Machine Works Eilenburg 3, Germany

WILFLEY Centrifugal SAND PUMP

PATENTED

for Slurry



Elimination of stuffing box has done away with many troubles common to centrifuga pumps.

Pump maintains extraordinary efficiency.

Wearing parts unusually heavy, insuring long life.

Cleaning out pump or changing wearing parts requires only a few minutes.

Described and illustrated in our new Catalog No. 6

A. R. Wilfley & Sons, Denver, Colorado, U. S. A.

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HEAVY DUTY SCREENS

The ORVILLE SIMPSON COMPANY

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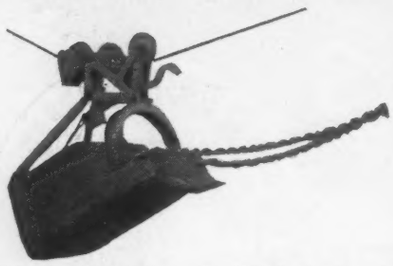
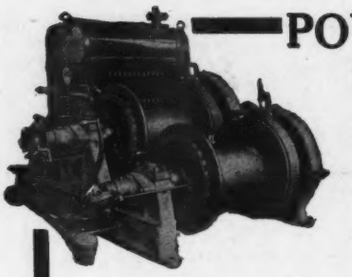
INSLEY PRODUCTS



Slackline
Cableways
Bin Gates
Cars
Gasoline
Shovels
and Cranes

INSLEY MANUFACTURING COMPANY Indianapolis

Engineers and Manufacturers



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Powerful and rugged, Flory Hoists are built to pull heavy loads and stand hard usage. That's why you always see Flory Hoists pulling the load when there's unusually tough work to be done.

Single, double, and three drums.

Flory Builds Steam, Gasoline, Electric, Belt Driven Hoists, Cableways, Carpullers, Dredging Machinery, etc.

SALES AGENTS IN PRINCIPAL CITIES

S. FLORY MFG. CO., BANGOR, PA.

FLORY HOISTS

ROBERT W. HUNT CO.

Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

CHICAGO

New York St. Louis 2200 Insurance Exchange Kansas City Cincinnati Pittsburgh San Francisco

Modern Blasting in Quarries and Open Pits

169 Pages

of interesting, practical and valuable information to quarrymen. We have a free copy for you. Write to

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(INCORPORATED)

946 King Street

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McGANN MANUFACTURING COMPANY, INC.

Engineers and Manufacturers

CHICAGO YORK, PA. NEW YORK

Oldest designers of lime plants and lime plant equipment in existence. We have specialized for many years in the design and construction of

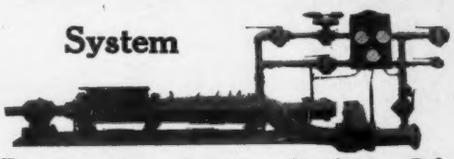
Single and Double Shell, Rotary Dryers—Rotary and Shaft Type Lime Kilns—Hydrators—Complete Lime and Hydrating Plants.

YORK Kilns and Dryers

SCHULTHESS Hydrators

FULLER KINYON

System



For conveying—elevating—distributing Pulverized Materials through pipe lines of extended length.

Cement—Raw Material—Flue Dust—Packer Spill —Gypsum—Lime, Etc.

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THE MERRICK CONVEYOR WEIGHTOMETER

Any material which is conveyor-handled can be weighed without additional handling or loss of time by the Merrick Conveyor Weightometer.

An Automatic—Continuous—Accurate Record

MERRICK SCALE MFG. COMPANY

Passaic, N. J.

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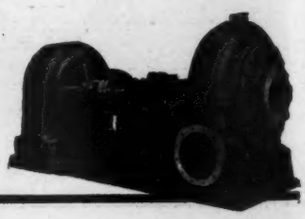
CENTRIFUGAL PUMPS

For hydraulic dredging, filling, sand and gravel production, hydraulic conveying of slurry and other liquids with semi-solid content. Types and sizes for the largest or smallest operations, and belt, motor, steam or gasoline-engine drive.



Write for Bulletin No. 125

Morris Machine Works

Baldwinsville, N. Y.

DUSTY OPERATIONS MADE DUSTLESS BY

PANGBORN

Consult us on any phase of Dust Suppression and Collection for any industrial operation.

Pangborn Corporation
Sand-Blast and Dust Suppression Equipment, Hagerstown, Md.

One Gravel Digging Unit Does the Work of Three on a One-Man Payroll

The Sauerman Slackline Cableway digs, raises and then conveys the materials — and only one man is needed to operate it. No distance from pit to plant is too great and production can be stepped up to as high as 4,000 cu. yds. per day (24 hours). Catalogue No. 9 is filled with drawings, pictures and descriptions. Write for it.

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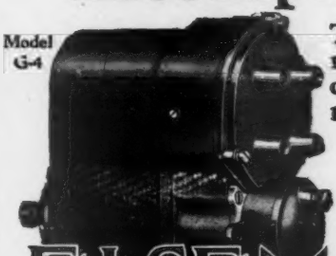
The Bonnot Company

Swing Hammer Mills
Bonnot-Cummer Dryers
Direct Fired Rotary Dryers
Ball Mills — Tube Mills
Rotary Kilns — Pulverizers

CANTON-OHIO

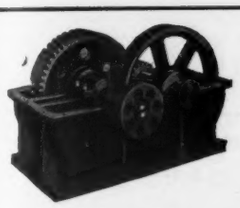
Incomparable



The world's premier magneto. Standard of the construction machinery industry.

EISEMANN

EISEMANN MAGNETO CORPORATION. 165 Broadway, N. Y.



Fawcus Double Reduction Herringbone and Spur Gear Drive

Simplicity and economy of construction, combined with high-grade workmanship and materials has made this type of speed reducer very popular among material handling people.

Our engineers are at your service to recommend the best type of drive for your requirements without obligation to you.

FAWCUS MACHINE COMPANY
Pittsburgh, Pa.

EASTON CAR AND CONSTRUCTION CO.

Makers of

QUARRY CARS

EASTON, PA. - KANSAS CITY, MO.

SLY *Dust Arresters*

Insure Dust Free Conditions

THE W.W. SLY MANUFACTURING CO.
CLEVELAND, OHIO
OFFICES IN ALL PRINCIPAL CITIES

Hardinge Mills

Catalog No. 13A

Ruggles-Coles Dryers

Catalog No. 16A

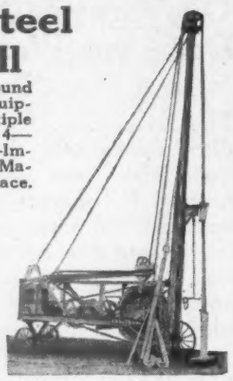
Hardinge Company, Inc.
YORK, PA.

120 Broadway, New York City
Continental Bank Building, Salt Lake City

Armstrong All Steel Blast Hole Drill

Ten outstanding Exclusive Features found Only in Armstrong Blast Hole Drilling Equipment: 1—All Steel Construction. 2—Multiple Cylinder Engine. 3—Wire Line Derrick. 4—Clutch Controlling Drilling Motion. 5—Improved Drilling Motion. 6—Bit Dressing Machine. 7—Patent Drill Bits. 8—Bit Furnace. 9—Magnetic Indicator. 10—New Chemical Solution. The use of Armstrong equipment insures greater production at less cost.

Write for "The Story of the Quarry"—a free book that gives the facts in regard to the Armstrong System of Blast Hole Drilling. Write us now.



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American DUST ARRESTERS

(CLOTH SCREEN TYPE)
FOR THE SUPPRESSION AND COLLECTION OF ALL FINE DRY DUSTS
OUR EXPERIENCED ENGINEERING SERVICE IS AVAILABLE

The American Foundry Equipment Company
454 BYRKITE AVE., MISHAWAKA, IND.

No leaks on Ebonite-packed lines

EBONITE Sheet Packing in joints and flanges insures pipe line operation free from annoyance and expense of frequent repacking. It gives first-class service on steam, air, hot water or acid lines, and stands highest pressures and temperatures.

EBONITE Keeps Joints Tight

Ebonite will not rot or harden

Quaker City Rubber Company
Manufacturers of Daniel's P.P.P. Rod Packing
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Branches: New York Chicago Pittsburgh San Francisco

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Rebuilt Dump Cars

20-yard, all steel, Western air dumps. Ten of these.
12-yard, steel underframe, hand dumps. Seven of these.
6-yard, steel underframe, hand dumps. Seven of these.

Rebuilt Locomotives

55-ton Baldwin 6-wheel switcher, separate tender, 200 lb. steam, built 1913.
43-ton Baldwin 6-wheel switcher, separate tender, 180 lb. steam, built 1917.
72-ton American 6-wheel switcher, separate tender, 180 lb. steam. Four duplicates.
42-ton American 4-wheel saddle tank, 180 lb. steam, built 1910.
31-ton Baldwin 4-wheel saddle-tank, built 1914.
21-ton Porter 4-wheel saddle tank, 165 lb. steam, built 1912, 36-in. gauge.

Rebuilt Locomotive Cranes

20-ton Link-Belt 8-wheel 2-line, built 1916.
20-ton Industrial 8-wheel, 2-line, built 1917.
22½-ton Ohio 8-wheel, 2-line, built 1915.

Birmingham Rail & Locomotive Company
Birmingham, Alabama

FOR SALE

24"x36" P. & M. Jaw Crusher.
200 tons 60 lb. Relaying Rails.
1—2"x6" Laboratory Jaw Crusher.
1—Set 36"x30" Smooth Rolls.
1—Set 18"x24" Spike Rolls.
2—10' Morgan Gas Producers.
2—8'x6' Ball Mills.
3—No. 5 McCully Gyratory Crushers.
1—No. 7½ Kennedy Gyratory Crusher.
10—8'x125' Rotary Kilns.
1—9'x100' Rotary Kiln.
1—7½'x80' Rotary Kiln.
10—5'x50' Rotary Coolers or Dryers.

Equipment Sales Company
Richmond, Virginia, and
Benson Mines, N. Y.

JAW CRUSHERS

1—30x36.
1—18x36.
1—15x24.
1—10x20.

GYRATORY CRUSHERS

1—No. 5 Austin.
2—No. 6 McCully & Gates.
2—No. 5 McCully & Austin.
1—No. 13 Telsmith.
1—No. 7½ Austin.
1—No. 9K Gates.

SYMONS DISC

1—24" Rebuilt.

HAMMER MILL

1—No. 12 Universal.

CLAM SHELL BUCKET

1—Blaw-Knox 2 yd. cap. Class 620-W, Dreadnought. Used 2 weeks.

A. J. O'NEILL COMPANY
406 Weightman Bldg. Philadelphia, Pa.

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USED EQUIPMENT

Machinery For Sale

Immediate Shipment—Attractive Prices

1—5'6"x50' Renneberg Direct Heat Rotary Dryer.
2—7'x7' Gates Ball Mills.
1—4'x16' Smidth Tube Mill, brick lined.
1—No. 6D Gates Gyratory Crusher.
1—5'x22" Hardinge Conical Mill.
1—24"x36", Style D, Jeffrey Hammer Mill.
3—Sets 20x14" Sturtevant Granulating Rolls.
1—Set 36x16" Sturtevant Balanced Rolls.

If you don't see what you require—inquire

UNITED UTILITIES, Inc.
17 W. 60th Street New York City

FOR SALE

12-TON GAS. ORTON CRANE —40-ft. boom, caterpillar; equal to new; overhauled; genuine bargain; located Chicago.

Address
Box 110, care of Rock Products
542 So. Dearborn St., Chicago, Ill.

MACHINERY FOR SALE

ROTARY CRUSHERS
Three No. 0, Three No. 1, One No. 1½, One No. 2 Sturtevant Rotary Fine Crushers, Three No. 0, One No. 1 Sturtevant Ring Roll Mill, One No. 2 Duplex Sturtevant Ring Roll Mill.

GYRATORY CRUSHERS
All sizes from No. 2 Reduction up to 12K.

JAW CRUSHERS
One 2"x6", Two 7"x10", Two 9"x15", One 6"x20", One 10"x15", One 10"x20", Two 12"x24", One 13"x30", One 15"x36", One 18"x36", One 24"x36", One 22"x50", One 36"x48", One 40"x42", One 60"x84".

CRUSHING ROLLS
One 8"x6", Two 16"x10", Three 30"x10", Two 36"x16", Two 42"x16", One 54"x24", Two 14"x20", and One 24"x12" Crushing Rolls.

DRYERS
One 3'x20', Three 4'x30', One 5'x40', Two 5½'x 40', One 6'x60', One 7'x60', and Two 8'x80' Direct Heat Rotary Dryers, One 5'x25', One 6'x30' Ruggles Coles type "A" and One 4'x 20' Ruggles Coles type "B" Double Shell Rotary Dryers, Three 6'x25' Louisville Dryers.

KILNS
One 4'x40', Two 6'x60', Two 6'x90', One 6'x 100', One 6'x120', One 7½'x80', Three 8'x 125'.

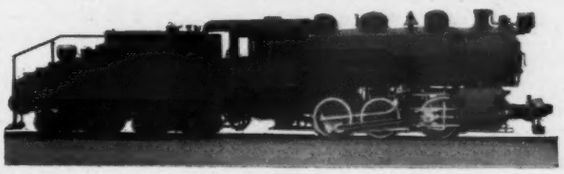
HARDINGE MILLS
Two 3', Three 4½', Three 6' and Two 8' Hardinge Mills.

SWING HAMMER AND TUBE MILLS
Fuller, Griffin and Raymond Mills, Screens, Air Separators, etc.

SPECIAL
One No. 6 Williams Universal Pulverizer.

THE HEINEKEN ENGINEERING CORP.
95 Liberty St. New York City
Telephone Hanover 2450

FOR SALE



75-ton, 21x26 in. American Locomotive Co. 6-Wheel Switcher, BUILT DECEMBER, 1922; piston valve; Walschaert valve gear; Alco power reverse; superheated; tractive power about 36,000 lbs.; steel wheel centers; steel running boards; steel cab; steel tender frame; electric headlights both ends; flexible staybolts. Complies all I. C. C. requirements, etc. READY IMMEDIATE SHIPMENT.
17—16-yd. WESTERN, heavy duty, steel beam type, 2-way dump cars. Some air, some hand dump. Rebuilt with entire new bodies, steel lined floors.
10—20-yd. WESTERN, all steel, two-way air dump cars; vertical air cylinders.
1—50-B Bucyrus Steam Shovel on caterpillars.

HAVE OTHER EQUIPMENT OVERHAULED AND READY
SOUTHERN IRON & EQUIPMENT CO. *(Est. 1889)* **ATLANTA, GA.**

FOR SALE

1—13-in. Telsmith Primary Breaker on Skids.
1—No. 6 Telsmith Belt Elevator, 45 ft.
1—40 in. x 12 ft. Telsmith Heavy Duty Screen.
1—General Electric Motor, 75 H.P., 220 volts, 60 cycle, 3 phase.

Plant purchased new, Fall, 1926. Excellent condition. Immediate shipment. Located near Reading, Pa.

McLEAN CONTRACTING COMPANY
1415 Fidelity Bldg. Baltimore, Md.

CRUSHING ROLLS

1—54x24 in. Allis-Chalmers, nearly new, Manganese Shells. In A-1 condition.

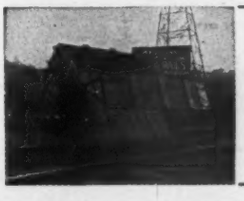
The Standard Slag Company
Youngstown, Ohio

RAILS New and Relay

ALL WEIGHTS AND SECTIONS
FROGS—SWITCHES—TIE PLATES

S. W. LINDHEIMER

38 S. Dearborn St. Chicago, Ill.



In stock 250—24" gauge 2-way Western and Austin dump cars, one and one and one-half yard capacity, in good serviceable second-hand condition. Also a number of new "V" shaped dump cars, 24" gauge: rails, new and relaying and all sorts of tracks supplies of all sections.

Park Row Bldg. New York City **M. K. FRANK** Union Trust Bldg. Pittsburgh, Pa.

Caterpillar Tractors

We offer for sale five brand-new, never used, 5-ton, 55 H.P.

Bear Caterpillar Tractors

There are none better as we have demonstrated on our own work. This is a bargain for new equipment.

ANNVILLE STONE COMPANY
Eighth and Willow Sts. Lebanon, Pa.

WE SELL NEW AND REBUILT

Blake Type Jaw Crushers
Cornish Crushing Rolls
Trommel Screens
Elevators and Conveyors
Drag Line Hoists
Air Compressors
Piston Rock Drills
Jackhammer Drills
Complete Crushing Plants
Complete Screening Plants
Rock Asphalt Plants

"WHAT ARE YOUR NEEDS"

E. A. MARTIN MACHINERY COMPANY
Phone 2117 Joplin, Mo.

When writing advertisers, please mention ROCK PRODUCTS

CLASSIFIED ADVERTISEMENTS
USED EQUIPMENT

DRAGLINES FOR SALE

One Bucyrus Class 24 Electric Dragline equipped with 3 ph., 60 cy., 440 v. motors, 100 ft. boom, 4 yd. D1. bucket, recording meter, 2300 v. to 440 v. transformers, and extra swing and hoist motors. Machine has skid and roller mounting, also self propelling truck mounting.

One Bucyrus Class 14 Steam Dragline with 80 ft. boom, 2 yd. D1. buckets, new boiler, caterpillar traction.

Both machines overhauled—A1 condition.

CENTRIFUGAL PUMPS

2—American Manganese 15 inch Sand & Gravel Manganese Pumps with 3 ph., 60 cy., 440 v. A.C. motors; 1-500 HP.; others 300 HP.
10—Allis-Chalmers 10 inch, 180 ft. head cap. Water Pumps, direct connected to 3 ph., 60 cy., 2200 v., 200 HP. motors.
1—Morris 12 inch Steam Drive, Water.
3—Morris 8 inch Steam Drive, Sand.
2—Morris 6 inch Steam Drive, Sand.

For prices or information address

The U. G. I. Contracting Co.
Attention: R. C. Stanhope, Jr.
Supervisor of Equipment
U. G. I. Bldg. Philadelphia, Pa.

Want to Sell Any Used Equipment?

We receive hundreds of inquiries from our 6,000 Sand, Gravel and Stone Producers, 30,000 Contractors, and 1,500 Concrete Product Plants, who buy their used equipment through our services.

Want to Buy Any Used Equipment?

We have every kind of well conditioned used equipment, located in every part of this country and Canada, and are saving our listed members thousands of dollars yearly on their purchases.

Want to Rent, Lease or Trade Any Equipment?

We have many inquiries from those who want to rent, trade and lease their equipment, and vice versa.
We will appreciate your inquiries.
Special: Two Complete Duntile Plants for sale at a bargain.

NATIONAL EQUIPMENT CO.
At Terms to Suit Purchaser
P. O. Box H. 232 Bloomington, Indiana

CRANES

1—40-ton, 8-wheel AMERICAN, Locomotive Crane, New April, 1927, 70 & 80 ft. boom, Bucket operating, Perfect Condition;
1—12-ton cap. NORTHWEST, Model No. 105, GASOLINE Caterpillar Crane, New Aug., 1926, 40 ft. Boom, Like new;

CRAWLER SHOVELS

4—MARION 21, STEAM, New 1926, ¾-yd. HIGH LIFT, 2 have 40 ft. Crane Boom Attachments, Low prices;
1—KOEHRING, GASOLINE, New 1926, 1-yd., HIGH LIFT, Overhauled, Like new;

DUMP CARS

30-yd., 20-yd., 16-yd., 12-yd. & 6-yd., Std. Gauge, STEEL, HEAVY DUTY, two-way side AIR and HAND Dump Cars, New 1926 & 1927.

GREY STEEL PRODUCTS COMPANY
111 Broadway, New York, N. Y.

Sell your discarded equipment! It's probably worth more than you realize. Try an advertisement in this section.

FOR SALE

4½x12 ft. Allis-Chalmers Tube Mill.
3-, 4- and 5-roll Raymond Mills.
No. 1, No. 00, No. 000, No. 0000 Raymond Pulverizers.
33-in. and 42-in. Fuller-Lehigh Mills.
36-in. x 42-in. Jeffrey Mill.
No. 2 Sturtevant Ring Roll Mills.
Infant, No. 2 and No. 6 Williams Mills.
6x22 and 8x48 Hardinge Mills.
3x16, 4x30, 5x30 and 8'8"x85' Ruggles-Coles Dryers.
8-ft. x 80-ft. single shell dryer.
16x12 and 14x20 Crushing Rolls.
54x24 Allis-Chalmers Rolls.

ROBERT P. KEHOE MACHINERY CO.
7 East 42nd St. New York, N. Y.

COMPRESSORS

2—I.-R. type XCB2, belt drive, capacity 877 cubic feet @ 110 lbs., short belt idler drive, 3 step control, with or without 220 H.P. synchronous Motor and control equipment. These units are 90% new.

A. J. O'NEILL CO.
406 Weightman Bldg., Phila., Pa.

FOR SALE
STONE CRUSHING MACHINERY
PRICED FOR QUICK SALE

1—Set Sturtevant Balanced Rolls, 21x11 in.
1—Sturtevant Duplex Steel Jaw Crusher, 6x15 in
1—Kite Jaw Crusher, 7x16 in.
1—Sturtevant Jaw Crusher, 8x19 in.
1—Williams No. 2 Hammer Mill.
1—Sturtevant No. 2 Rotary Crusher.
1—Champion Jaw Crusher, 9x15 in.
1—Jeffrey Type A Hammer Mill, 30x24 in.
1—Allis-Chalmers Roll Crusher, 24x14 in.
8—6x4 in. Bucket Elevators, 30 ft. centers.
1—Sturtevant 3-Tier Moto Vibro Screen, Type MV, with screw feed.
1—8x6 ft. Trommel Screen.
1—60 H.P. Locomotive Type Boiler, 100 lb. pressure.

Write, wire or phone your inquiries
CONSOLIDATED PRODUCTS CO., Inc.
15 Park Row, New York City Barclay 0603

FOR SALE

Complete gravel dredging plant with the following equipment, built in March, 1926:—Dredge Boat, 36' long x 18' wide; two pontoons, 8' x 16' supporting 10" Swintek Cutter with 10 HP motor; one 8" late type AMSCO Pump belted to 150 HP slip ring motor with drum controller and resistance; one 3 drum Thomas extra heavy duty motor driven hoist; one high pressure priming and bilge pump, motor driven. All motors 3 phase, 60 cycle, 220 or 440 volts. 600 ft. 8" discharge pipe with flexible couplings and Knox clamps. Pump and equipment in first class operating condition. Will demonstrate at any time. Price $10,000 for immediate sale.

The East End Sand and Gravel Co.
Chillicothe, Ohio

FOR SALE

One Mead-Morrison two yard Dragline Hoist. 100 HP. Lincoln motor, 3-phase, 60-cycle, 220 volts. Used in the production of only 200,000 tons of material.

SCULLY SAND AND GRAVEL CO.
118 First Street Cambridge, Mass.

FOR SALE

1—4'x26' Cummer Dryer.
1—5'x50' Bonnot Dryer.
2—36" Bonnot Pulverizers.
1—5'x4' Allis-Chalmers Ball Mill.
2—50-ton Coal Hoppers.
Bucket Elevators and Screw Conveyors.

J. S. LEWIS, Jonesville, Mich.

UNIVERSAL CRUSHER COMPANY
Eastern Agents

All Steel Jaw Crushers. Also used equipment in crushing and power lines.

HOOPER-MOMBERGER CO.
90 West St., New York City Phone Rector 2918

FOR SALE

Externally fired rotary dryer, 5"x50', with exhaust fan; used only a short time and in good condition. Can be bought for half price. Address

Box 97, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

FOR SALE

Shovels, Marion 350, 6-yd., electric.
Draglines, Sauerman, steam, 3-yd., Crescent.
Loco. Crane, 40-ton Industrial.
Hoist, 12x12 3-drum Lidgerwood.
Hopper—steel portable, Northern 12-ton.
Orange Peel Bucket, 1½-yd. Kiesler.
Rails, 300 tons, 60-lb. Chicago del'y.

A. V. Konsberg, 312 S. Clark St. Chicago

FOR SALE

Owing to change of equipment at our plant we offer for sale—One 8-in. Amsco pump, direct connected to Twin City gas engine. Mounted complete on steel frame. This unit is floated on a 5-section wood barge, 18x25 ft.

SPICER GRAVEL CO. Marseilles, Ill.

Bargain Prices
100,000 Lbs. Capacity
ALL STEEL ORE HOPPER DUMP CARS
MCB condition. Ready for service.
Cheap freight to any part U. S. A.
DULUTH IRON & METAL COMPANY
Duluth, Minn.

USED EQUIPMENT WANTED

Wanted—Tile Machine

Will purchase used hand Spanish roof tile machine if priced reasonable.

JOHN H. ODENBACH
544 Lincoln Alliance Bank Bldg.
Rochester, N. Y.

WANTED TO BUY

Gas Producer with capacity to gasify 30 to 40 tons bituminous coal per 24 hours. Please give name of make, its rated capacity, mechanical condition and lowest price.

Longview Lime Works, Longview, Ala.

CLASSIFIED ADVERTISEMENTS

USED EQUIPMENT WANTED

WANTED

For our quarry at East Liberty, Ohio:
1—Gasoline locomotive, 5 or 7 ton, 36" gauge.
1000' of 30 or 40 pound rail.
10—3 or 4 yd. side dump cars, 36" gauge, preferably with wooden bodies.

Lewis & Copeland Construction Company
Lima, Ohio

BUSINESS OPPORTUNITIES

Sand and Gravel Plant For Sale

Capacity 1250 tons per ten hours. Located on New York Central Railroad. Good territory and splendid prospects for future. Plant has always been a profit maker. Present owners desire to devote their time to their investments in Florida.

LAKE SHORE SAND & GRAVEL COMPANY
Erie, Pennsylvania

PARTNER WANTED

Experienced quarry operator desires partner for purchase of crushing plant located eastern Pennsylvania. Excellent deposit trap rock, good market and prices. Present plant capacity 200 tons per day. Can be enlarged to produce 500 tons at small expense. This proposition can be made very profitable. $15,000 required. Address

Box 103, care of Rock Products
542 South Dearborn Street Chicago, Illinois

FOR SALE OR ROYALTY

Sand and gravel pit, also silica sands, two miles east of Lodi, O. Railroad on each side pit; running water for washing sands; electricity available; very light overburden, convenient to load. Stands test at Columbus, O. Correspondence invited. Address

G. W. Hantz Seville, O., No. 2

SITUATIONS WANTED

PACIFIC COAST SALES ENGINEER AND district manager wishes to affiliate with a live organization supplying machinery or equipment to cement, plaster, lime and grinding plants, having held a position as Pacific Coast Manager with a well known organization in Chicago for seven years. Desires to make change. Is in personal touch with all the operators and executives in this territory from El Paso, Texas, to Edmonton, Canada, including Denver. Thoroughly familiar with all plant operations. Address Box 2271, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

PLANT MANAGER OR SUPERINTENDENT —Technical graduate, ten years' practical experience in management of mines, quarries, crushing and grinding plants both in East and far West; capable, resourceful and with excellent references as to ability and character, wishes to connect with large concern offering opportunity for permanency and advancement or with new company just entering the business. Can design, build and operate plants efficiently. Now employed. Can report in thirty days. Address Box 2267, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

SALES ENGINEER WITH LONG EXPERIence with stone crushing machinery is open for engagement. Would prefer interest in quarry operation, preferably in silica sand mill or where fine grinding is required. If you have a mill that is not operating profitably, write me. I can make it pay. Address Box 2280, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

WANTED—SITUATION AS SALES MANAger for building materials. Eighteen years' experience all branches, such as Crushed Stone, Sand and Gravel Pits, Freight Rates, etc. What have you to offer? Address Box 108, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

SITUATIONS WANTED

POSITION DESIRED BY SUPERINTENdent qualified through long experience to successfully handle any crushed stone or gravel operation. Thoroughly familiar with every phase of the business, including plant design and construction. Dependable and practical supervision given the work at all times. Several years experience in extensive production of hard rock. Locate anywhere. Remuneration in accordance with results obtained. Satisfactory references. Address Box 104, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

AVAILABLE, YOUNG MAN WITH BROAD experience as production clerk and assistant superintendent wishes to make permanent connection with company that will recognize executive ability in the handling of plant shipments, payrolls, operating costs, books and correspondence. Familiar with all phases of crushed stone industry. An adaptable and energetic hustler that can assure efficient results. Address Box 96, care of Rock Products, 542 So. Dearborn Street, Chicago, Ill.

WANTED—A POSITION AS SUPERINTENdent of lime plant. Eighteen years experience; familiar with most all kinds of kilns, fuel and hydrating systems; now employed but desire change for good reason. Available 30 days after acceptance of other position. Would consider foremanship of any department where promotion would be based on results obtained. Address Box 109, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

CEMENT CHEMIST WITH REAL EXPERIence in both wet and dry process mills wants position with organization that expects results and willing to assure a future for the right man in return. Location or difficult mix conditions no drawback as long as proposition is legitimate. Exceptional record and references. This man is well known in the industry and in good standing. Address Box 107, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

SUPERINTENDENT, 20 YEARS PRACTICAL experience in construction operation and maintenance of rock crushing, washing and pulverizing plants. Competent quarry and pit operation. Thoroughly experienced with all types mill and quarry machines, auxiliaries and power equipment. Efficient material handling and organizing of operating crew. Available now. A1 references. Address Box 105, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

WANTED—POSITION AS CHIEF CHEMist in cement plant. Have had broad experience in the cement industry with 18 years actual operation. Thorough knowledge of quarry and mill supervision, burning with oil or coal, wet or dry process. Age 37 and married. Can furnish complete record with best of reference. Address Box 100, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

SUPERINTENDENT — DESIRES ENGAGEment; thoroughly familiar with stone crushing, sand and gravel operations; competent and efficient operator; location South or West. Prefer working on bonus basis or tonnage contract. Excellent references. Address Box 99, care of Rock Products, 542 South Dearborn Street, Chicago, Ill.

ENGINEER, EXPERIENCED IN DESIGN, construction and operation; cement, lime, crushing, pulverizing, conveying, ore handling and treating plants. Considerable experience in other industrial manufacturing lines. Address Box 2253, care of Rock Products, 542 South Dearborn St., Chicago, Ill.

MILLWRIGHT AND BLACKSMITH WITH years of experience in crushing stone and upkeep of plants, especially babbitting crushers, wants work. Prefer south or West Virginia. Address Box 94, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

SITUATION WANTED

Those seeking positions can readily find them by making their wants known to a large number of employers who read the advertisements in this section.

SITUATIONS VACANT

WANTED
UNUSUALLY GOOD ADVERTISING MANAGER

Million dollar corporation, machinery manufacturer, located in a 40,000 city in the East, established over twenty years, the leader in its line, is about to establish a Sales Promotion Department. Applicant must have at least three years experience as the assistant or manager of the advertising department of machinery manufacturer and have established record in all the branches of sales work. Between 35 and 40, graduate Mechanical Engineer, with pleasing personality and good appearance. Experience must include work of a regular salesman, also the surveying of fields for new markets and the addressing of association gatherings. Replies to receive consideration must be accompanied by photo, specimens of trade paper ads and direct mail material, and give a brief but still comprehensive outline of education, experience, and salaries received. Also state salary expected and give complete list of concerns previously connected with. All replies will be treated strictly confidential and present employer will not be communicated with except you suggest it. Address Box 106, care of Rock Products, 542 So. Dearborn St., Chicago, Ill.

MANUFACTURER OF COMPOSITION, ALSO cast stone fireplaces, desires man with large experience in both wet and dry process. Wonderful opportunity for a man who has the following qualifications: An organizer; able to handle men, practical knowledge of the reaction of chemicals; carry out experiments, work up own designs and supervise modeling. In fact, handle this Department of a growing concern. Must be able to furnish best of references. Address Box 102, care of Rock Products, 542 So. Dearborn St., Chicago.

To Employers Who Advertise for Men:

These advertisements of "situation open" and "situations wanted" are all bona fide, and in a large majority of cases from firms and men known personally to one or more of the staff of Rock Products.

It sometimes happens, when an employer receives a number of applications for a position open, he neglects to acknowledge some of them.

As a matter of courtesy and good will in our relatively small and closely knit industries, the applicant should receive some acknowledgement. If the employer does not wish to disclose his identity he may make the acknowledgement on plain letter paper.

The applicant is, in practically every instance, a bona fide operating man in the rock products industry. Otherwise he would never see a copy of Rock Products, as it has no circulation outside of those definitely interested in the production of these commodities.

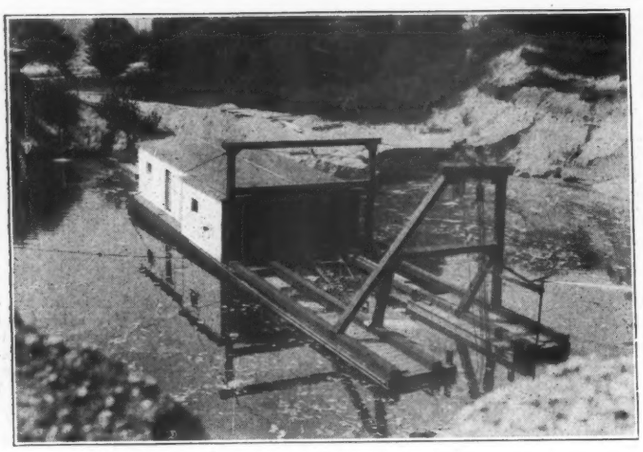
Unless the applicant receives some acknowledgement he does not know that his application forwarded through Rock Products has been properly taken care of or not; and a very good candidate for some future employment is discouraged from answering these blind advertisements, to the detriment of both employer and employe.

Therefore, for the good of all our industry, employers and employes, please treat such applications with the same courtesy you would any other business communication.

—The Publishers.

Greater Output---More Profit

.... with the SWINTEK Suction Screen Nozzle



THE accompanying photograph shows a Swintek Suction Screen Nozzle in operation on the dredge of the Broadway Sand and Gravel Company, Cleveland, Ohio. This equipment assures a continuous flow of material through the suction nozzle—for it does away completely with the possibility of its being clogged by boulders and debris contained in the deposit. It loosens and agitates the material, and carries away by means of a traveling screen everything that might otherwise clog the nozzle.

The Swintek Suction Screen Nozzle means CONTINUOUS OPERATION — GREATER OUTPUT—MORE PROFIT! Ask for complete information.

We also manufacture the Eagle Sand and Gravel Washers—the most modern and efficient washing equipment available.

EAGLE IRON WORKS Des Moines, Iowa

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